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Estimating Future Metal Supplies 565
New Outlet for Tin and Columbium 567
Spotlight on the Stope 567
Albanian Mining Crisis Looming 569
Hot and Cold Under the Collar 569
Mining Projects in Egypt 569
SPECIAL ARTICLES
Israel's Mining Expansion 571
Portuguese Switch to Tin 571
Major Metals in the Next Forty Years 573
New Zealand's Ironsands May be Used for Steelmaking 574
Chile's Ten-Year Plan 576
TECHNICAL BRIEFS 577
New Processes for Mineral Dressing; Complex Gold Ore Treated by Unusual Flotation; Research on Gold Recovery at Teddington; Wet Magnetic Separator; Centrifugal Sand-Water Separator; Development in Industrial Minerals Beneficiation; Effect of Temperature on Coal Flotation; Using Chemicals to Cut Water Loss; Densometer Controls Grinding Circuit; Dissolution of Zinc from Sphalerite; Processing Beryllium Ores; Analysis of Sample Data from Estimating Ore; Underground Ore Washing; Tantalum in Chemical Plants
MINING MISCELLANY 580
METALS AND MINERALS 585
Why the Americans Want a World Aluminium Agreement; U.S. Free Market in Silver Planned; Bolivia and Wolfram Prices; Quicksilver Price Unchanged; Anglo-Canadian Uranium Talks; Kitimat's Millionth Ton; Price of Gallium Cut; Development of India's Mica Industry; S.W. Africa Manganese Output
LONDON METAL MARKET REPORT .. 587
Copper Stocks Rise Again; Tin Waits for Congress; Lead Prices Steady; Zinc Prices Improve; Official Turnovers
MINING FINANCE 588
A New Gold Mine? Kepong Nears the End; London Market Highlights; Arbitrage Made Easier; Rand Selection Final Increased; Kamunting—Adequate Provisions; Katanga — Union Minière — U.N.; Chenderiang Tin Dredging; New Alluvial Tin in Tasmania; Harties Development; S.A. Townships Preliminaries; Another Kimberley
London Metal and Ore Prices 589

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Estimating Future Metal Supplies

MANY studies have been made and many reports have been written on the future supply of mineral raw materials, individually and collectively, for a specific country or region or for the world as a whole. The most ambitious example was, of course, the four-volume survey published by the President's Materials Policy Commission in 1952 and popularly known as the Paley Report, which sought to project Free World resources of metals and minerals against a supply-demand pattern for the 25 years ended 1975. Since this report appeared, however, many new factors have arisen—technological, political, strategic and economic—which have substantially modified a number of the underlying assumptions on which the Paley estimations were based. Moreover, reserves of some minerals have been greatly augmented by the discovery of major occurrences, an outstanding example being the vast bauxite deposits in Queensland, while the potentialities of the oceans as a future source of mineral supply are now beginning to be more fully appreciated.

To compare the statistical picture as it enfolds year by year with growth projections published during the previous decade is a fascinating exercise which, however, becomes largely of academic interest as time goes on. The projection of future mineral supply and demand is essentially a continuous process. The results of each authoritative study, when first made public, might be likened to a beacon which lights up the road immediately ahead; if the whole of the road is to be clearly illuminated a constant succession of beacons is required.

Apart from the fact that long-range availability studies provide information which is essential for the guidance of all concerned with any aspect of future mineral supplies, the very summarising of the present state of knowledge of major metal resources calls attention to the inadequacy of that knowledge, and herein may lie the chief value of the study. This point is made by Bruce C. Netschert and Hans H. Landsberg in a survey entitled "The Future Supply of the Major Metals", published by Resources for the Future, Inc. This study, as the authors emphasise, is essentially a reconnaissance survey, undertaken as part of a survey of the entire resource position of the United States up to the end of the present century. In order to identify potentially critical problems, estimates of resource and material requirements are matched against estimates of potential supply. Where foreign supply is involved, this necessitates consideration of the demand-supply situation in the world as a whole.

The question of depletion, as the introductory chapter points out, is inseparably linked with costs of production. Superior techniques for making a metal available to society have conduced to lower cost. Although a decline over the long term in the cost of any metal because of such progress may not be demonstrable, a technological innovation at a given time may result in lower costs of exploitation for current reserves and, in addition, may make possible

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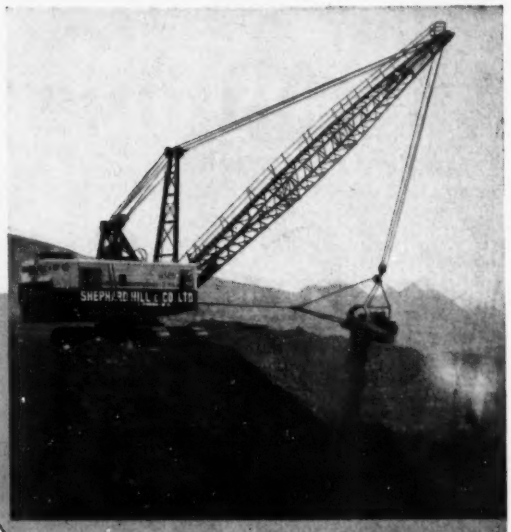

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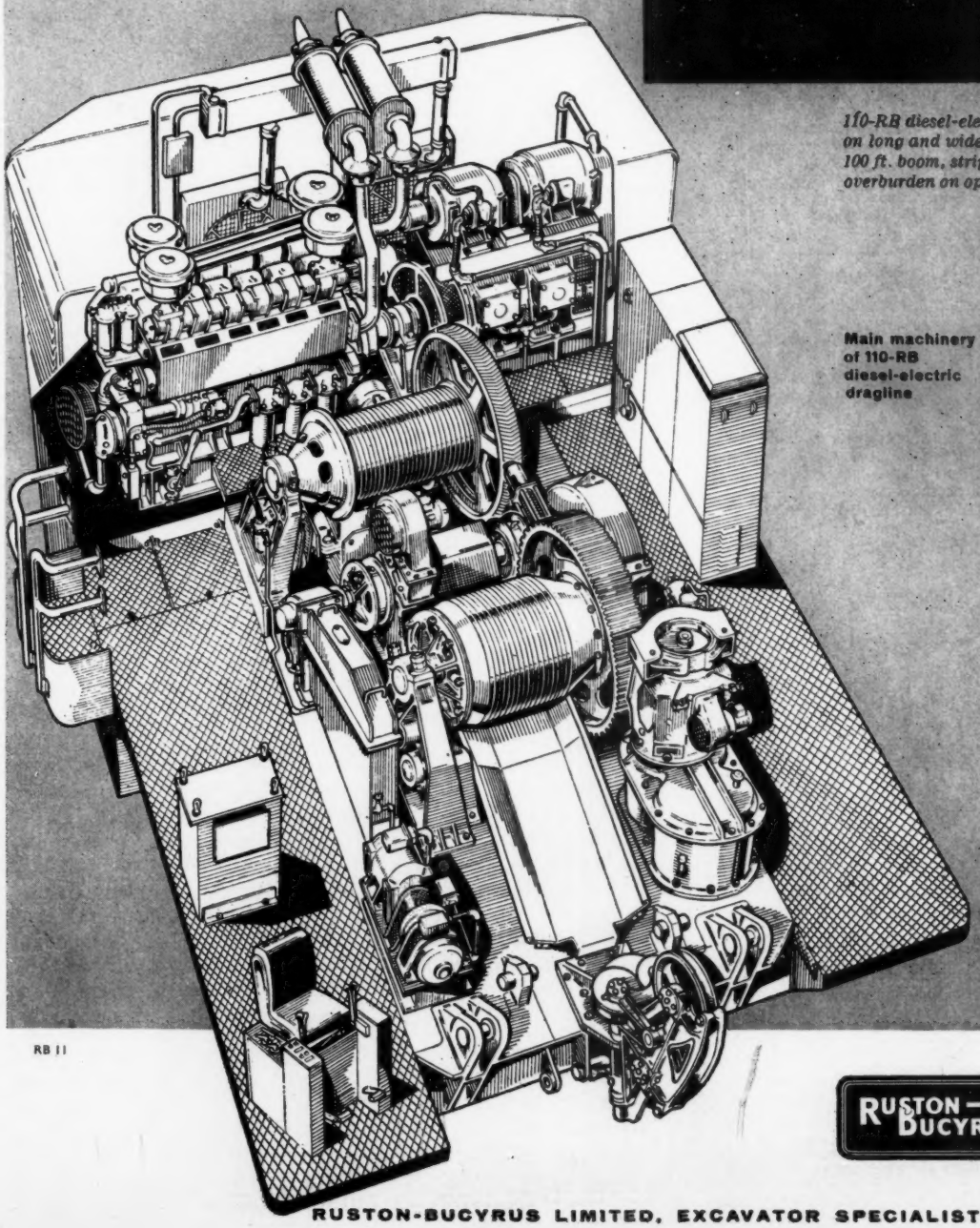

Main machinery of 110-RB diesel-electric dragline

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the exploitation of previously potential ore at the same cost. It is even possible that over the short term technology may thus "create" more reserves than are discovered in the same period.

Against this wide-ranging benefit from technology must be placed the implications of the present level of world demand for many metals and the prospect for future growth in that demand. Already, demand in many instances has reached such high absolute levels that past experience in maintaining an adequate current supply at no higher real cost may not be relevant in assessing the future. All indications of future economic growth point to truly enormous future demands, both annually and cumulatively. Estimated future demands are now attaining such magnitude that the adequacy of reserve discovery and of the effect of technology on potential ore usability cannot be taken for granted. Is it possible that the magnitude of demand may require recourse to potential ore even in the absence of offsetting cost benefits from technology? And, if there are discontinuities in the spectrum of natural concentration of a particular metal in its occurrences, is it possible that significant cost increases could be incurred?

It was with thoughts such as these in mind that the present reconnaissance survey was undertaken. Its coverage is restricted to the six major tonnage metals: iron, manganese, aluminium, copper, lead and zinc. It was considered that little would be gained by including any of the other metals. Either resource knowledge is hopelessly inadequate, state the authors, or substitutes can be readily provided.

Each of the six metals selected is considered in the light of the U.S. domestic reserve-resource position, U.S. domestic supply versus demand, the world reserve-resource position, and world-supply versus demand. Some of the principal findings are summarised on page 573.

NEW OUTLET FOR TIN AND COLUMBIUM

A new and potentially significant outlet for various metals, notably columbium and tin, is indicated by discoveries at the Bell Telephone Laboratories in the United States, where work on superconductivity has been in progress for more than eight years. Investigations at this research centre have led to a new way of generating magnetic fields of fantastic strength by utilising a compound of columbium and tin (Nb_3Sn), fabricated and reacted upon by special metallurgical techniques.

According to an article in the journal *Tin*, the phenomenon of superconductivity was first observed by the Dutch physicist, Kamerlingh Onnes, as long ago as 1911. Onnes found that the electrical resistance of some metals disappeared at very low temperatures, below which the metals could carry electrical current without dissipating energy. The many possible applications of this phenomenon were immediately apparent, but for many years the discovery could not be put to practical use because of the difficulty and very high cost involved in maintaining the extremely low temperatures required.

In the past few years interest in superconductivity has been revived and "cyrogenics", as the technique of low temperature work is called, is now a subject of research in many parts of the world. One possible application is the construction of electromagnets made of superconductors which would not require any electrical energy to maintain the magnetic field once it was established. Until quite recently, however, superconductivity appeared to be incompatible with high magnetic fields, for most of the materials studied by Onnes lost this property when the magnetic field became greater than a few thousand gauss. New attempts were made in 1941 and again in 1960 to produce a magnetic field with a superconductor, but the only effect was to emphasise the need for a material which would retain its superconducting properties in high magnetic fields.

This difficulty has at last been overcome, for studies at the Bell Laboratories have shown that the required combination of properties is possessed by a compound of niobium and tin in the ratio of three to one. Bars made by melting columbium metal and tin together at about 2,400 deg. C. were found to be superconductors (i.e., they had zero electrical resistance in magnetic fields up to 88,000 gauss). Furthermore, in these high fields they could carry electrical currents of up to 3,000 amperes per c^2 at a temperature of 4.2 deg. K. (the boiling point of liquid helium) without heating or using up energy in any way. Techniques were subsequently developed whereby the mechanical brittleness of the Nb_3Sn produced by the original method could be overcome without affecting the unusual properties of the material.

The new development is expected to have many important applications where large volumes of magnetic fields are required. One example is in the field of communications—especially radio and radar—where the discovery will permit consideration of the use of much higher magnetic fields, by which means it should be possible to provide increased band width for use in radio-relay systems. Another promising area is the study of physical phenomena at high magnetic fields. In the past, the cost of producing high fields in the laboratory has greatly restricted scientific investigation in this area.

Perhaps the most exciting prospect, however, is in the realm of power generation by thermo-nuclear fusion, sometimes described as the peaceful application of the H-bomb reaction, but more conventionally known to scientists as magnetohydromagnetics (MHD). So far the main difficulty in the construction of nuclear-fusion reactors for power generation is that a large proportion of the power produced by the reactor would have to be applied to the creation of a magnetic "bottle" powerful enough to contain the high temperature gas-plasma involved. The use of superconductive solenoids with Nb_3Sn, which in principle would not require any power, would permit a much greater flexibility in the design and study of fusion reactors. Workers at the Bell Laboratories, together with many U.S. firms working on MHD, believe that this compound may be the key device for which world-wide nuclear fusion research has been waiting.

SPOTLIGHT ON THE STOPE

South African stoping methods, lagging far behind the high standards achieved by Springbok shaft sinkers and tunnellers, have been widely discussed in the Republic's technical press during recent months. Sparked off by the surprised criticism of overseas visitors to the recent Mining and Metallurgical Congress, the comments have been answered in part by the submission that in the widespread opening up of South Africa's new gold areas attention was naturally centred primarily on sinking and development.

Until the ground was blocked out, operations in the stopes were not scrutinized with the same intensity as were the initial mining activities. However, now that the shaftsinking programme is no longer monopolizing the South African mining scene, the spotlight has been turned on the working face. This degree of attention is possibly long overdue. Stoping operations account for some 25 per cent of total working expenditure in the average mine and thus the need for economies is manifest.

The general pattern of stoping operations in South African gold mines has changed but little over the past few

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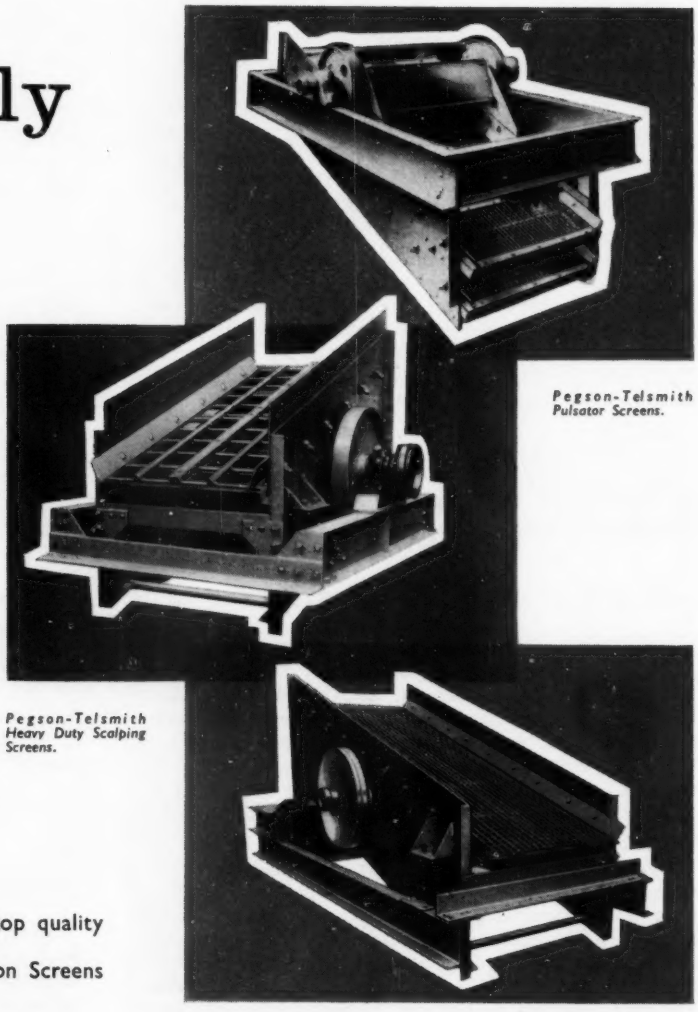

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decades—possibly a concomitant of plentiful cheap labour. This condition cannot be assured for ever. Increasing labour charges and a rising ventilation bill are but two of the factors which are going to be very much in the minds of mining engineers over the next few years.

The first step towards increased productivity is the obvious one: concentrated mining with a high degree of mechanisation. Although these desiderata are easily defined, they are not so easily attainable. A possible line of attack appears to be longhole stoping. The first work to be done on this was at South Roodepoort and West Rand Consolidated, starting in 1957. Since then further experience has been gained with the system, notably on other mines of the General Mining Group. Longhole stoping eliminates the need for a multitude of short shotholes — frequently badly drilled and charged—and gives a considerable saving in labour, explosives and stores. The system, however, stands or falls by the accuracy of the initial drilling operation, and current experience suggests that after 50 ft. drilling efficiency falls off sharply. This limitation poses a problem which can be shared between manufacturers and mine management.

A good example of this co-operation is evidenced at the Buffelsfontein experiment. Here, in the initial stages, considerable difficulty was experienced in devising means of drilling longholes to a high degree of accuracy in respect of position and direction without the necessity of employing a heavy and unwieldy drilling machine. To this end, Holmans designed a Thruster Rig, capable of accommodating a 3 in. rock drill. It would appear that, providing a good start is made with the initial ten feet or so, there is little deviation when drilling to the rise.

Essentially this new South African method of mining is similar to the pulsed infusion blasting system which has been used for years in certain British collieries. Obviously a case can be made here for a closer liaison between hard rock and soft rock miners. Again, high rates of advance on long stopes could bring a need for a new approach for hanging wall support. Yielding supports may well be the answer, and nowhere has there been more experience for such support systems as in the coal mines of Europe. For too long has the South African goldminer considered his problems as being completely distinct from those of miners in other fields.

The current reappraisal of stoping operations in the Republic provides an opportunity for wider thinking. There is evidence that this has been realised.

ALBANIAN MINING CRISIS LOOMING

The withdrawal of virtually all technicians of "Khrushchev-Communist" countries from Albania during the past few weeks of internecine crisis points to a setback in Albanian mining production plans. This would be one effect of a breaking-off of relations between Czechoslovakia and Albania, the former country having promised aid in the erection of the ferro-chrome and copper refining installations due to open in 1965, as was mentioned in "The Mining Journal Annual Review, 1961". Czechoslovakia would, however, also suffer from the loss of Albanian contact, as the Czech nickel plant due to open at Sered next year will be dependent upon Albanian nickel ore to be delivered under a long-term contract.

A break with the Russian-bound countries would also mean the search on the part of Albania for new customers, probably in the Asiatic Communist sphere. Copper and nickel imports into the Russian satellites from Albania would probably be replaced without much difficulty by purchases from "member" countries such as Bulgaria, Poland, Eastern Germany and Russia itself. Nevertheless, any withdrawal of Albania from the Russian sphere of influence would mean radical alterations within the mining section of the Cominform economic co-operation body Comecon.

HOT AND COLD UNDER THE COLLAR

Mining engineers throughout the world have for many years been fighting against the problems of excessive heat in deep mines, refrigeration has been in use since the early 1930's. Today with the development of the mining industry in the Canadian arctic the problem is reversed and mining engineers in that area are now faced with the difficulties of heating large volumes of air. In the past there have been many investigations into the problems of cooling air, but heating mine air is a relatively new field.

The main significance of these developments, whether heating or cooling mine air, is the growing awareness of the importance of climatic conditions underground, in order that labour may be used efficiently. Too often in the past, particularly in hot mines, the main consideration has been whether or not the conditions were tolerable; whether, in fact, they were adequate to prevent death by either heat stroke or heat exhaustion. On the question of heat stroke and heat exhaustion a considerable amount of research has been done and information is available about the limits of the human body. However, on the question of efficiency levels a great deal of work remains to be done.

Far too little is known about the effect of climatic conditions underground upon the efficiency of the human body. Yet this is a vital problem. Quite apart from ergonomics there can hardly be a mining area in the world where labour costs are not continually rising and it is therefore increasingly important that the optimum use be made of the labour factor.

The main elements of the problem are; air temperature both wet and dry, air velocity at the working place which must in part be a function of the mining method and the length of the working shift. Each of these elements must be considered against work output. It is basically a question of economics, how much additional expenditure on ventilation is warranted? In many areas the answer is bound to be "a great deal" but before the expenditure can be justified considerable research must be done.

Already a certain amount of empirical research has been done in South Africa but a great deal more remains to be done and it must be complemented by fundamental work. One of the problems is the lack of instruments, the kata thermometer is a valuable instrument for safety but not for research.

MINING PROJECTS IN EGYPT

Preliminary work for a number of mining projects is stated to be in hand at the Egyptian Ministry of Industry in Cairo. These plans include the laying at a cost of some £E8,000,000 of a railway line from the Al Bahria oasis to the Nile Valley for transportation of iron ore and other minerals, the exploitation at a cost of £E7,000,000 of an iron ore deposit recently discovered in the country's Eastern Desert, the exploitation of manganese ore in the Sharm El Sheikh area, of iron ore in the Al Bahria oasis and of copper ore from an unspecified site. Further projects foresee the mining of coal in the Ain Mussa reserves on the Sinai Peninsula (£E5,000,000) and in the Buda and Saura coalfields (£E3,500,000), the exploitation of the El Hamrawein phosphate deposits and the recently-discovered graphite reserves in the Eastern Desert, the building of an ilmenite concentration unit and the extension of the phosphate mining schemes in the Safaga and Kosse regions.

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Israel's Mineral Expansion

AT the Sixth Session of the Technological Advisory Board held in Israel, reported briefly in our issue of October 27, Mr. Menahem Bader, Director-General of the Ministry of Development released figures showing an encouraging trend in the development of Israel's mining and mineral processing industry.

Mining Companies' Development 1955-1961

	1955-6	1958-9	1960-1
Dead Sea Works Ltd.			
Production	21,280 tons	104,000 tons	134,486 tons
Turnover	I£926,000	I£8,691,000	I£11,635,000
Gross Profit (or loss)	I£3,900,000 (loss)	I£2,214,000 (profit)	I£3,916,000 (profit)
Dead Sea Bromine Co.			
Production	—	1,580 tons	3,500 tons
Turnover	—	I£1,370,000	I£3,250,000
Gross profit (or loss)	—	I£204,000 (loss)	I£518,000 (profit)
Fertilizers and Chemicals Ltd.			
Production	178,250 tons	327,000 tons	333,111 tons
Turnover	I£8,730,000	I£22,305,000	I£28,776,000
Gross Profit ..	I£1,207,000	I£5,020,000	I£6,181,000
Israel Mining Industries Ltd. (*Timna Copper Works*)			
Production	—	662 tons	5,836 tons
Turnover	—	I£460,000	I£7,957,000
Gross profit ..	—	running in	I£1,960,000
Negev Ceramic Materials Ltd.			
Production	21,000 tons	29,133 tons	52,991 tons
Turnover	I£344,000	I£392,000	I£1,242,000
Gross profit ..	I£17,000	I£55,000	I£126,000

Turning to future developments, Mr. Bader stated that with the production increase of the Dead Sea potash plant to 600,000 tons annually in the coming four years, the bromine plant to 10,000 tons per year, the erection of a plant for an annual production of 75,000 tons magnesite and a plant for the yearly output of 20,000 tons of various bromides and so on, the total production of the Dead Sea Works complex will reach approximately 799,000 tons by the end of 1965, and some 1,100,000 tons during 1970.

According to Mr. Bader, the Negev Ceramics Materials Co. plans to double its output of glass sand and various clays, and to construct a plant for the production of alumina. The Israel Mining Industries aims to double its output of copper through the expansion of plant. Negev Phosphates Co., Oron, plans to beneficiate phosphates by means of calcination up to 38 per cent P_2O_5 and to reach an annual output potential of some 200,000 tons. Furthermore, the company intends to construct a defluorinization plant for phosphates, to erect a caustic soda plant with an annual capacity of 60,000 tons and a triple superphosphate plant with (100,000 tons capacity).

The official report of the Advisory Board states that, as expected, the underground mine at Timna could be developed during the five-year period as planned, but the principal concern of Israel Mining Industries Ltd. is to build up the necessary labour force. Ore reserves in the open pit mine are dwindling and within a year or so the underground mine will become the only source of ore supply. At present, 16 English miners are employed, assisting in the preparation of the belt tunnel. With the co-operation of the Ministry of Development and a training organisation, a group of 15 local miners was sent to European countries for training.

Since the scheme was proposed last year, progress has been made in leaching and copper refining, and as a result of test work in Haifa and at Timna, means have been found to leach the ore in a coarser grind. This should lead to reduced investment and grinding costs, and enable copper-bearing solutions of a higher concentration to be used. An amended flow sheet and plant layout is in the course of preparation and it is expected that it will serve as a basis for revised cost estimates.

Looking further ahead, considerable progress in the extraction and refining processes of copper has been achieved at the laboratories in the concentration and purification of the copper-bearing solution by means of solvent extraction. A scheme for continuous piloting at Timna is now under examination. Operation of such a pilot plant together with an experimental unit for the recovery of pure copper from concentrated solutions (by-passing the cementation smelting operations) is under consideration. As an alternative, the general design of the smelting and fire refining facilities has been completed by foreign consultants.

The report adds that production costs at Timna plant have continued to decline steadily during the year. Output from April 1 to August 1, 1961, in terms of 100 per cent copper was 2,262 tons. At this rate of production, the annual output should total over 6,700 tons.

In order to determine the amenability of Har-Ramin iron ores to concentration, the report says that Israel Mining Industries Ltd. treated 200 tons of run-of-mine ore in its Haifa laboratories, where 80 tons of concentrate were produced. These concentrates, with 10 tons of middlings, have been shipped to Germany for sintering and tests. This product will be sent to a company in Norway for smelting and economic evaluation using the same smelting techniques as now practised at Acre Steel City.

Portuguese Switch to Tin

A MONTHLY output of 50 tons is the aim of the directors of a recently opened cassiterite smelting plant at Mangualde in Central Portugal, but so far no mention has been made of the expected quality of the metal to be produced. The foundry, which has been in operation for some time, has an annual capacity of 7,200 tons of ore. In 1960 exports of tin from the foundry amounted to 1,055 tons, and in the first nine months of 1961 exports were valued at 80,000,000 escudos. The foundry is associated with another in Nigeria.

Mineral Production—August 31, 1961

	Tonnes
Iron Ore	358,611
Cassiterite	1,683
Gold and silver bearing concentrates ...	4,583
Scheelite	57
Wolfram	3,401
Mixed wolfram and cassiterite ...	346
Cupreous iron pyrites	999,593
Iron pyrites not roasted	87,677
Gold bearing pyrites	642
Roasted and leached pyrites	18,643
Manganese	2,613

In view of the depressed state of the wolfram market, it appears that cassiterite will soon take the place of wolfram in Portugal—Europe's largest producer of this ore.

Mineral Export—May 1 — August 31, 1961

	Tonnes
Iron pyrites not roasted	59,677
China Clay	6,471
Gold bearing pyrites	6,417
Roasted and leached pyrites	22,389
Manganese	506
Wolfram	969
Tin metal	859

The new plant now being erected on the left bank of the River Tagus for the production of steel is reported to be progressing well. Some supplies of raw material will be obtained locally; others will be Nigeria and other countries, some in Portuguese India and some in Angola.

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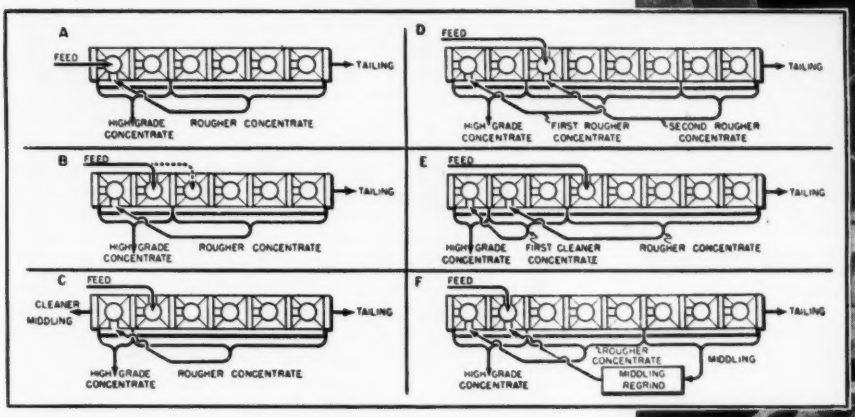

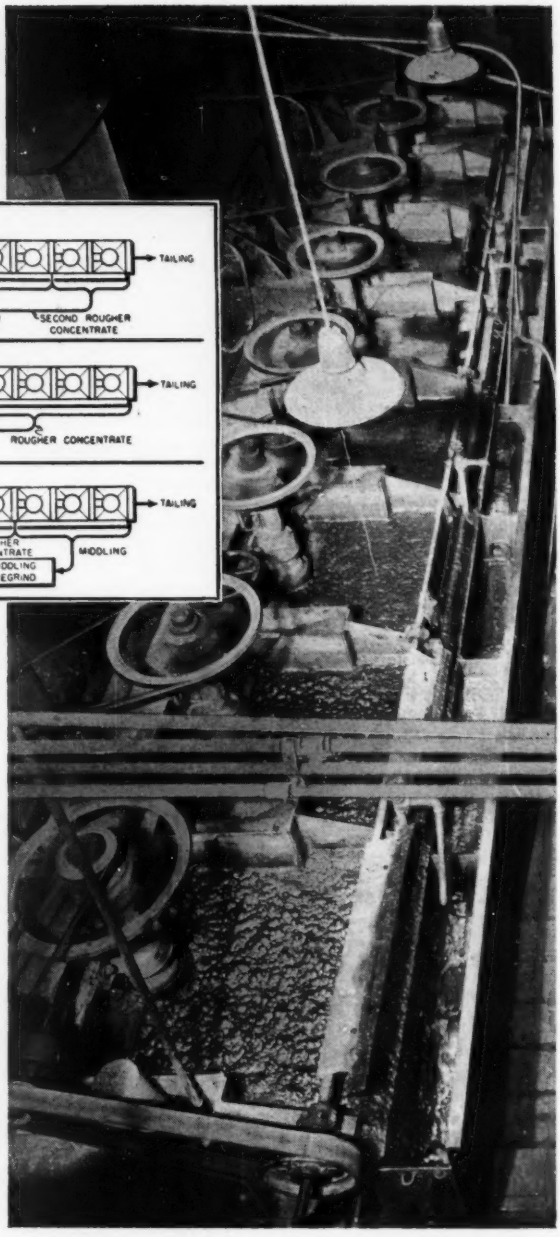

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Major Metals In The Next Forty Years

A reconnaissance survey entitled "The Future Supply of the Major Metals" has been published by Resources for the Future, Inc., 1775 Massachusetts Ave., N.W., Washington 6 D.C. (price $1.00). The authors are Bruce C. Netschert and Hans H. Landsberg. The metals covered in this 65-page study are iron, manganese, aluminium, copper, lead and zinc. The sections on iron ore and manganese are here summarised. Those dealing with the four non-ferrous metals will be reviewed in a future issue.

THE iron content of commercial ore in the United States now ranges from over 50 per cent to about 20 per cent. Lower grade ore is processed, or "concentrated", so that the product is equivalent or even superior, ton for ton, to the high-grade ore that can be shipped without preparation. In addition to the range in iron content, there is also a wide variety of ore grades depending on the quantity of impurities present and whether or not the ore is "self-fluxing".

The most recent authoritative estimate places the total iron content in U.S. iron ore reserves at nearly 3,000,000,000 tons, together with some 20,000,000,000 tons contained in potential ore. Commercial use of further low-grade, siliceous, iron-bearing material in the Lake Superior region has occurred subsequently to this estimate, so that an unknown quantity should be transferred from the potential ore to the reserve cafegory.

The survey points out that no one has yet considered as potential iron ore material that has an iron content of, say, 10 per cent (where iron is the principal or only commercial metal) or that can be worked at something like ten times present costs. In view of the average 4.7 per cent iron content of the earth's crust, it can be said that at a level far removed from current reserve criteria there exist in the United States limitless quantities of potential ore that have never been the object of serious investigation.

Cumulative U.S. demand projected to the end of the present century is compared with the reserve-resource position and with cumulative production at the 1957 rate of 54,000,000 l.tons (as the highest recent level). The significant fact emerging from this comparison is that current reserves of approximately 3,000,000,000 tons are little more than half the cumulative demand, up to the year 2,000, of nearly 5,000,000,000 tons. Production cannot be maintained for the rest of the century at the present level without the discovery of new reserves or the creation of reserves out of presently potential ore beyond what has already been accomplished. Self-sufficiency in iron ore would require the addition of new reserves in the next 40 years more than equal in quantity to present reserves.

Iron Ore Reserves

The difficulty in defining iron ore reserves in connection with the U.S. domestic scene is intensified abroad. Steel-making practices vary more widely between countries than they do within a single country ; hence what is acceptable as ore at the blast furnace varies greatly. If this is strictly taken into account, the measurement of iron ore reserves must be limited to deposits currently being worked. A broader and, therefore, vaguer concept can be applied by including in reserves any deposit that is currently uneconomic solely because of location. This appears to have been the concept behind the most recent authoritative estimate of world iron ore reserves and resources, which places them at 128,000,000,000 l.tons of direct shipping ore and 227,000,000,000 tons of ore requiring beneficiation, the total iron content amounting to 129,000,000,000 tons. It is only since World War II, however, that the deposits of Africa, northern North America, South America and Asia have received serious attention. Hence the reserve and potential ore data tend to represent only initial or early estimates of the contents of the deposits and commonly make no pretence of being complete in coverage.

An assessment of reserves and resources against demand indicates that, at currently likely growth rates in demand, there should be no concern with increased iron ore costs due to resource depletion at least until the end of the century, and probably well beyond.

Manganese

Manganese, like iron, is mined with a wide range of methods at many different levels of natural concentration, and this, together with the complex mineralogy of its ore bodies, makes the distinction between reserves and potential ore difficult. Commercial ore that can be shipped directly contains a minimum of 35 per cent manganese, but a commercial concentrate of "synthetic ore" can be produced from manganiferous ore of lower grade.

In the United States the distinction between reserve and potential ore is not difficult because of the absence of high-grade deposits. Total U.S. reserves are given as 5,800,000 s.tons of ore containing 880,000 tons of manganese, while manganese contained in identified potential ore is estimated at 77,300,000 tons.

If there is no change in its present inability to utilise the potential ore, the United States can be expected to rely almost wholly on foreign sources of manganese at current costs, supplemented by a continued miniscule domestic production. The projection also indicates that, even if the continued efforts of Bureau of Mines research on commercial utilisation of the domestic potential ore were successful, there would be only a brief respite from reliance on foreign sources.

The widespread occurrence of manganese ore, the variety of deposits and the range in the grade which could be worked commercially, make the estimation of world reserves and resources very crude. With the reservation that any tabulation of reserve-resource data is little more than a minimum guess. World reserves of the larger deposits are placed at over 400,000,000 tons of contained manganese in some 1,100,000,000 tons of ore. Nine countries contribute more than 95 per cent of the world total and the U.S.S.R. alone accounts for more than half of it.

Little can be said about potential ore. Low-grade manganese deposits, some of very large size, have been identified throughout the world, but the current ample supply situation has provided no incentive to ascertain their size and content. According to one guess there is another 1,000,000,000 tons of low-grade material with less than 20 per cent manganese content. If the average is taken as 10 per cent, another 100,000,000 tons of manganese is known to exist. An additional potential is afforded by the ocean floor. It has been estimated from the few data thus far available that in the Pacific alone the total quantity of manganese-bearing nodules may run into hundreds of thousand million tons, and the manganese content to tens of thousand million tons. According to J. L. Mero it is technically and economically feasible to mine the nodules by hydraulic dredging.

If world manganese demand were to grow at a rate of 5.3

per cent (the rate of growth experienced in world manganese-in-ore production between 1950 and 1960), cumulative demand would amount in 2,000 to 775,000,000 tons. To meet such a demand, additions to reserves of at least twice the present level would have to be forthcoming during the remainder of the century, if recourse were not to be had to presently potential ore. Even then, the use of ocean floor deposits and improved technology for exploiting the lower-grade materials on the continents offers the possibility of no cost increase. A growth rate of this magnitude over the 40-year period is unlikely, however, since the high rate of the 1950 decade was due, in part, to the comparatively low starting level in the aftermath of World War II. In the second half of the decade, from 1955 to 1960, the rate was only 3.2 per cent, indicating a cumulative demand of 457,000,000 tons by 2,000. This growth, which may be considered more likely than the larger alternative, indicates that current world reserves will be largely exhausted before the end of the century. Since more than half the total is in Communist countries, there is a very strong probability that current reserves in the non-Communist countries will be seriously depleted well before then.

Offsetting this indication, however, are several important aspects of the future supply-demand situation. On the supply side, reserve figures, especially in the underdeveloped countries, are understated. The "discovery" of additional reserves in known deposits may be confidently expected.

Of potentially greater importance, however, is the possibility of a future decline in the growth rate of manganese demand. It has been found that as little as 4 lb. of manganese per ton of ingot steel production can produce the desired results in the steelmaking process. This compares with an average of 16 lb. in the U.S. in recent years.

Future manganese requirements may also be reduced by making use of the secondary supply that results from the loss of manganese in slag in the steelmaking process. For every ingot ton of steel some 12.4 lb. of manganese are wasted on the slag dump; this is only a little less than the manganese added in the steelmaking process. Several processes of recovering and utilising the manganese in slag have been demonstrated to be technically feasible, but the costs are so high that the potential of secondary supply cannot as yet be considered for the period through 2,000.

Even on the assumption that research and development efforts on potential ore utilisation in the next few decades are no more successful than those in the past, the authors of the survey conclude that there is little reason to expect a rise in manganese costs during the twentieth century for either the United States or the world as a whole because of resource depletion. In view of possibilities for lower manganese unit requirements, "discoveries" of additional reserves in known deposits, true discoveries of new deposits, secondary recovery and the ocean floor opportunities, the manganese situation should take care of itself.

New Zealand's Ironsands May Be Used For Steelmaking

By J. GRINDROD

SCIENTISTS in the experimental foundry of the Auckland Industrial Development Laboratories, New Zealand, have developed a 63-year-old alumino-thermic process whereby high-quality steels may be made in small quantities from New Zealand's ironsands. The developed process, which depends on the reduction of the ironsands by finely-divided aluminium powder, was recently publicly demonstrated for the first time to the Auckland branch of the New Zealand Institute of Foundrymen.

A German Process

Called "thermit reaction", the process was originally discovered in Germany in 1898 and was first used for welding. A great amount of heat is generated, with temperatures in the range of 2,200 deg. C. and higher. At this temperature, the ironsand is reduced to molten steel, which can be run off for alloying with other metals for casting or the steel produced can be cast directly into the mould. Molten slag is also produced and this can be run out of the crucible after the steel has been tapped off. The process is started with a gas torch which heats the mixture until a reaction starts between the ironsand and the aluminium.

A major factor influencing the decision to investigate the alumino-thermic process for steel production was that the largest constituent of the charge, namely magnetite, lay in unlimited quantities, though in an impure form, on the west coast beaches of both the North and South Islands of New Zealand. It was known from a series of tests conducted during 1956 and 1957 that both ironsand and ilmenite could be reduced by the alumino-thermic process. Both iron-ingots and ferro-titanium alloys were produced by this method and it was found that sufficient heat was released to melt both metal and slag and allow clean separation to take place. However, due to the high heat losses on such a small scale, pouring of the metal was not possible, the ingots being obtained by breaking up the cooled slag. By heating ferro-titanium produced from ilmenite by the alumino-thermic process with a further quantity of ilmenite, it was found possible not only to recover the iron, but to produce very high titanium slags.

As distributed on many of the west coast beaches of the North Island, the ironsand, after grinding and magnetic separation from gangue material and ilmenite, has the following approximate per cent composition: FeO 28.5, Fe_2O_3 53.3, Total Fe 59.0, TiO_2 7.8, SiO_2 5.0, MnO 0.56, CaO 0.60, V_2O_5 0.40, MgO 2.4. In addition, the sand contains a small amount of alumina, while sulphur and phosphorus are present in quantities which, though small, are significant. The mineral is basically magnetite with a proportion of the iron atoms replaced by other atoms, notably titanium. The separated sands are considered to consist of about 80 per cent Fe_3O_4, the remaining 20 per cent being intimately bound oxides that, though unwanted, cannot be separated from the magnetite by any practical process.

In the case of the South Island west coast sands the position is different. Here, the strongly magnetic fraction consists of magnetite containing little or no titanium dioxide. Gillespie's Beach, in particular, has deposits that are relatively pure, one analysis reporting 96.5 per cent magnetite, 1.6 per cent titanium oxide and only 0.11 per cent phosphorus.

Because of the proximity of the more impure North Island sands, most of the work done at the Auckland Industrial Development Laboratories has, for economic reasons, been aimed at using these sands.

As aluminium powder is expensive and in any case has to be imported, aluminium scrap, reduced to particles

of suitable size in a small plant at the site set up to disintegrate a molten stream of aluminium by air jets, is used in the New Zealand adaptation of the alumino-thermic process.

In formulating an alumino-thermic mixture using ironsand, it was realised that, although the 20 per cent extraneous material would absorb heat, at the same time it would form part of the slag and thus reduce the melting point of the otherwise almost pure alumina. By reacting ironsand with finely divided aluminium it was expected that the mineral would behave as a mixture of oxides and that these would be decomposed in order according to the positions of the elements in the following list, those at the beginning forming the most stable oxides and therefore being the most difficult to reduce: calcium, magnesium, aluminium, titanium, vanadium, silicon, manganese, chromium, zinc, iron, nickel, lead, copper. Only those metals expected to be present and derived either from the ironsand or aluminium have been included in the list. At temperatures sufficiently high to allow mobility of the atoms, the aluminium metal could be expected to combine with the available oxygen at the expense of all the oxides subsequent to it in the list. Similarly, any other particular metal would tend to decompose the oxides of any subsequent metal and yield oxygen to those before it in the list.

Theoretically, a ratio of 1 part aluminium to 4 parts of sand would reduce all the iron present and leave all the other oxides present unreduced, but this was thought to be unlikely to happen, since some of the iron and other oxides would probably be dissolved in the slag. Initially, at any rate, some of the manganese, silicon and titanium was expected to be reduced. Due to the short time available equilibrium was not expected to be reached and it was decided to produce conditions in the reaction vessel that would allow only iron to be reduced, using a ratio greater than 1:4.

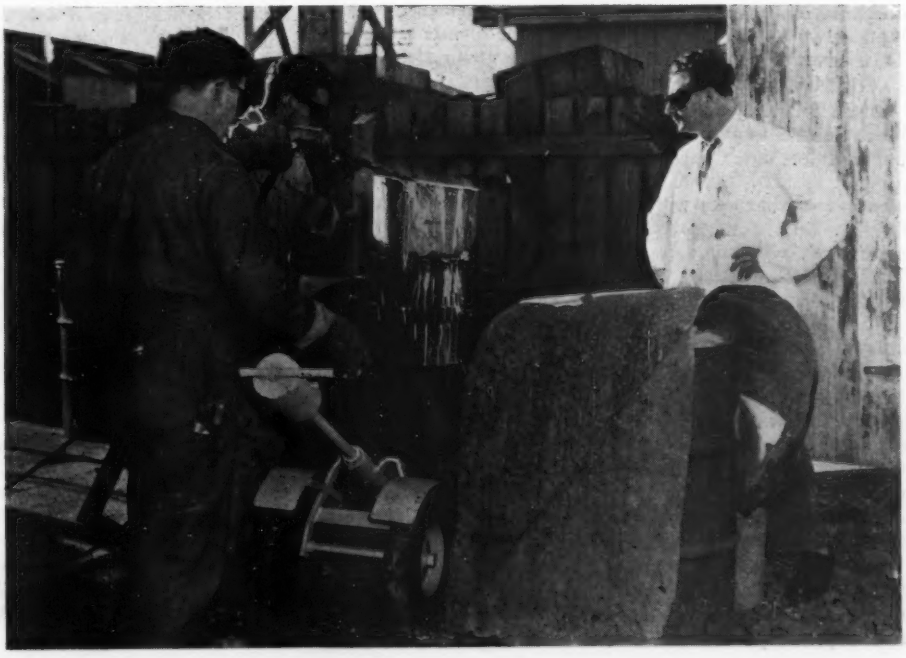
Manufacture of Castings

To make a specified steel casting the following separate stages were necessary: reduction of the iron oxide in a reaction vessel with an excess of iron oxide present; separation of the metal from the slag; deoxidation of the residual iron and other oxides; addition of the required alloying elements; pouring; the whole process having to be completed in a few minutes. Two crucibles were used, the top one being called the reaction vessel and the lower one the ladle. A ratio of 1:4½ was found to be the minimum needed to produce almost pure iron and most of the subsequent experiments were made on this basis for the subsequent production of steel.

In order to leach some of the phosphorus from the ore during cleaning, a Norwegian practice of using very dilute nitric acid (a 1—2 per cent acid solution) was employed. This preferentially removed enough of the phosphorus to bring the phosphorus content of the steel made within the upper limits of most steel specifications. As the sand produced by this acid pre-treatment was cleaner than that produced by dry magnetic separation alone, the aluminium-sand ratio was adjusted to 1:4.4.

Certain precautions are recommended by the Department in using the process. For instance, moisture should be entirely eliminated from the charge materials and they should be dry and clean. Any other substances forming gaseous products when burnt such as carbonaceous materials, coal, oil, wood, etc., and substances that decompose on heating, such as limestone and sea shells, should also be excluded. Substances, such as commercial burnt lime, soda ash and common salt, which, for a variety of reasons are added to fluxes, should not be used unless proper precautions have been taken and consideration given to possible effects. Aluminium scrap should be free from cutting oils, while the inclusion of zinc base material would be injurious to health.

The aim of these investigations by the New Zealand Department of Scientific and Industrial Research has been primarily to place molten steel on the floor of local foundries and the use of the ironsands has beena secondary consideration. Though the process would employ only a small fraction of the ironsands available, several factors mentioned make their use possible, including the ease by which a comparatively high grade and uniform concentrate can be obtained by washing and magnetic separation and their freedom from combined moisture.



Starting the reaction with an oxy-acetylene torch. The process recently developed in New Zealand has been publicly demonstrated to the Auckland branch of the New Zealand Institute of Foundrymen

Chile's Ten-Year Plan

THE population in Chile is multiplying at the impressive annual rate of 25 per 1,000, states a critical appraisal of the country's Ten-Year Plan, published in the latest Quarterly of the Bank of London and South America. This means that in 1961 alone, some 200,000 inhabitants will be added to those already seeking to maintain and improve their share of goods and services. To achieve, therefore, an improvement in living standards of the order of the 2½ per cent a year increase in *per capita* income, as envisaged at Punta del Este, Chilean national income must grow by 5 per cent a year.

The formidable nature of the task confronting the Chilean planners becomes even more apparent in the light of the disparity between future aims and past results. Statistics of *per capita* income show that in recent years the flow of goods and services on to the Chilean market has barely kept pace with the growing number of consumers. The reasons for the relative stagnation of the economy are the source of much controversy. Some critics of the present Administration see President Allessandri's determined efforts to contain inflation as a further inhibiting feature in an economy fundamentally lacking in momentum and suffering from long-standing structural deficiencies.

Aim of the Plan

A sense of direction and a concerted effort to restore a dynamic quality to the economy are now necessary, states the article. This is the aim underlying the Ten-Year Development Plan announced at the beginning of this year after a long period of study and preparation directed by the Corporación de Fomento de la Producción (CORFO). In its final form the plan has as its main objective an improvement in living standards by raising the annual rate of growth of the national product to 5.5 per cent. It was held that any annual increase of less than 4.5 per cent would be insufficient to permit the required degree of capital formation, while any attempt to go beyond 6 per cent would call for an excessive amount of foreign aid. To achieve the requisite growth, a programme of investment in local and foreign currency has been drawn up for both the public and the private sectors. This investment will amount to the equivalent of 10,148,000,000 escudos over the next ten years.

In the first five years of the plan foreign credits and investments amounting to $1,035,000,000 will be necessary, but an amortisation payments in the period are expected to amount to $707,000,000, the net increase in the nation's overseas indebtedness will be a substantially lower figure. Of the total foreign assistance required, $485,000,000 are assured by existing agreements and undertakings, and a further investment of $375,000,000 in various projects is considered probable. Most of the balance of $175,000,000 will be sought from the IBRD and other international credit organisations.

With foreign finance and public investment playing such important roles, there can be little doubt that the success of the Ten-Year Plan rests very largely on a careful control of the balance of payments and the national accounts. In Chile both these accounts are closely linked with copper mining, since this industry still contributes some 68 per cent of the nation's foreign exchange earnings and about 15 per cent of fiscal revenue.

Under the present system the inflow of foreign exchange from exports of copper made by the large American-owned mining companies (accounting for more than 90 per cent of total copper exports from Chile) is not directly linked to the market value of such exports, since the law requires the companies to return in foreign exchange only a sum equivalent to their production costs. Despite this fact, the nation's exchange earnings from copper (as distinct from the copper companies' earnings) are related through the taxation of profits to the value of exports, and the price fluctuations in the international copper market are very much a matter of national concern.

All calculations in the Ten-Year Plan have been based on an average copper price of 30 U.S. c. per lb. and a steadily increasing volume of copper exports. The long-term uncertainty of the copper market is a disturbing factor in Chilean development. In the five years 1956-1960 the annual average of prices on the London Metal Exchange (affecting 90 per cent of Chilean copper sales) has been the equivalent of 42, 27, 25, 30 and 31 U.S. c. per lb.

The Ten-Year Plan

Under the Ten-Year Plan the large mining companies are expected to raise their output from its present level of about 500,000 tonnes a year to one of about 750,000 tonnes. Since the plan was originally introduced, however, the American-owned companies have been criticised by all the major political parties and in July the Minister of Mines stated that by means of special taxation devices the companies would be induced to raise output to 900,000 tonnes a year by 1970. The tax structure at present applicable to copper profits dates from a Law of 1955, under which the companies have contributed to the Treasury a sum varying between 50 and 75 per cent of their profits (see *The Mining Journal*, September 8, 1961, p. 229).

Recently, legislation was passed by the House of Deputies to raise these taxes still higher to provide for a 16.6 per cent increase in the wages of workers in both the public and private sectors. In a letter to the President of the Senate, Mr. Robert Haldeman, Braden's vice-president, pointed out that the new Bill would mean that the company would have to pay an 82 per cent tax on its net profits plus an additional 8 per cent next year. With taxable profits expected to be $46,200,000, he said, tax payments would total $37,800,000 —$33,300,000 income tax, plus $2,700,000 under proposed new taxes and $1,800,000 under a previous law passed by Congress to finance increased pay for the armed forces. He added that "such a policy of constantly increasing taxes on copper companies discouraged them from making new investments". It is understood, however, that the new Bill will allow any new investments made by the companies to increase production to be charged against additional taxes.

It might be added that negotiations for the annual sale of 60,000 tonnes of copper to Russia (in which the Chile Government sets great store) have been in progress for a considerable period. Earlier this year the deal appeared to have fallen through after Russia had failed to agree on the terms of the purchase, which Chile insists should consist of 25,000 tonnes of electrolytic and 35,000 tonnes of wire. However, the negotiations are now thought to be reaching their conclusion and a decision from Russia is expected within a month or so. The attitude of the American-owned companies to the proposed deal has not yet been disclosed. Under American Government regulation, exports of copper from the United States to Communist countries are not normally permitted. It has yet to be seen whether Anaconda and Kennecott would be prepared to sell Russia copper produced and refined in Chile. There have been rumours of their refusal to do so.

Technical Briefs

New Processes for Mineral Dressing

A novel method for upgrading rock salt has been developed by International Salt Company in the United States, which appears to be not only practical but has been used on a commercial scale at the company's mine in Detriot.

The process consists of two main steps. First, the crude rock salt is exposed to radiant heat, when the pure salt crystals remain relatively cool whilst the impure crystals are selectively heated since they fail to transmit the heat as effectively. After passing through this heat treatment, the crude rock is deposited on a high-speed conveyor belt, which is coated with a heat-sensitive resin. The pure crystals are discharged over a tail-pulley, but the impure fragments adhere to the belt somewhat longer, and consequently their trajectory is different.

Pohl and Plymate of Princetown University Plastics Laboratory have devised the isomotive cell, which makes use of dielectric polarisation for effective particle separation.

The operation consists of passing the finely divided material through a pair of diverging electrodes in a dielectric liquid, while the particles pass down a tilted tray.

The ability of the apparatus to separate materials of closely similar dielectric constant has been demonstrated using alumina and fluorite with dielectric constants of 8.5 and 6.9 respectively and it would appear to offer possibilities for commercial application.

COMPLEX GOLD ORE TREATED BY UNUSUAL FLOTATION

Recent progress in milling and gold extraction at Giant Yellowknife Gold Mines has been described (R. J. C. Tait *Bull. CIMM*, April, 1961) where recovery of the gold, which is intimately associated with sulphides including arsenopyrite, stibnite and antimony sulpho-salts, is almost entirely dependant on flotation, by roasting the flotation concentrate and cyanidation of the calcine.

In 1958, a large two-stage fluosolids roaster was put into operation at a medium temperature, but later the temperatures in both stages were gradually lowered to determine whether it was feasible to operate at such temperatures. Although operation is smooth and continuous when temperatures were reduced from 1,100 deg. F and 1,300 deg. C. to 925 deg. F and 875 deg. F in the first and second stages respectively, the low temperature roasting brought more cynanicides to the calcine circuits, and a two-stage washing circuit had to be added, as well as a preliminary fresh water grind. Furthermore, since the initial extraction rate is high, special measures are taken to separate the high value pregnant solution from solid as quickly as possible in order to avoid reprecipitation of gold, known to occur at times, particularly in thickeners.

Grinding and flotation control have also been found to be vitally important. Concentrate must be as coarse and granular as possible to maintain bed fluidity and prevent dust losses and the fine grinding once practised must be avoided.

To achieve the desired conditions, unit cells are used in the primary grinding circuit and flotation is carried out in stages. The tailing from the first rougher units is classified in cyclones, the overflow treated in a "slime flotation circuit" whilst the underflow is reground and floated in rougher and scavenger cells. By so doing, the sulphides are maintained in a granular state and recovery is improved. Only the fine material in the flotation concentrate is cleaned, the coarser fraction from cyclone separation being sent direct to the roasters.

RESEARCH ON GOLD RECOVERY AT TEDDINGTON

A three-year programme of work on an ion exchange method for recovering gold from cyanide liquors is being supported by the National Research Development Corporation at Teddington. Compared with the conventional precipitation by zinc, an ion exchange method has advantages, in that it can be used to deal with solutions containing relatively large amounts of copper or nickel; it tends to yield a higher purity of gold; it makes it possible to recover other metals such as nickel, cobalt or even copper; it gives a potentially higher recovery of the gold and lastly, combined with a resin-in-pulp technique, it may be possible to eliminate the solid-liquid separation step.

WET MAGNETIC SEPARATOR

The application of the Jones wet magnetic separator to the beneficiation of iron ore (paper No. 31, International Mineral Processing Congress (I.M.M.) London, 1960), has recently been discussed by Stone in Canada, who points out that concentration of hematite and siderite is now limited to dry separation using high magnetic intensity, which involves drying costs whilst separation ceases to be sharp below 100 mesh.

The writer claims that the Jones separator will operate on an unsized feed, is effective on fine material and will concentrate a mixture of hematite and magnetite. Furthermore, separations have been made on material hitherto considered difficult, if not impossible, by conventional methods, and cost of treatment will be low, the power for excitation being less than 0.1 kWh/ton treated for specular hematite.

The performance and reliability of the separator has been proved in the laboratory and on pilot plant scale, and an 800 lb. per hour unit is under construction for a hematite producer. A 6-ton per hour and a 40-ton per hour unit are designed.

CENTRIFUGAL SAND/WATER SEPARATOR

The Krebs Centrifugal sand separator, which is now made available in England by Neldco Processes, is claimed to achieve 97 per cent efficiency in removing fine sand, scale and similar materials from water. It replaces conventional sand traps, and is considered to effect substantial savings in capital and maintenance costs. The energy for the separator is supplied by the main circuit pumps, and it has no moving parts. Wear is thus considered negligible.

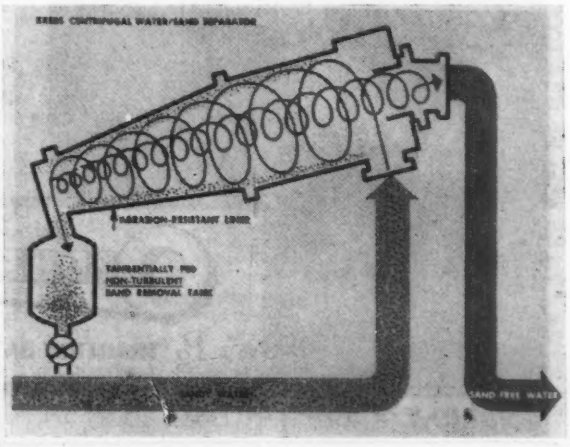
Standard sizes have capacities from 50 to 1,600 gals. per minute and larger sizes can be built to order. Capacity depends on pressure drop required, but the following approximate figures are given: Size W 100, capacity is 50-300; size W 200, capacity 300-1,600.

DEVELOPMENT IN INDUSTRIAL MINERALS BENEFICIATION

A paper by R. A. Logman entitled, "Some Recent Developments in Industrial Minerals Beneficiation", was recently presented at Industrial Minerals Division, IAME and CIM at Ottawa, which included the following interesting notes:

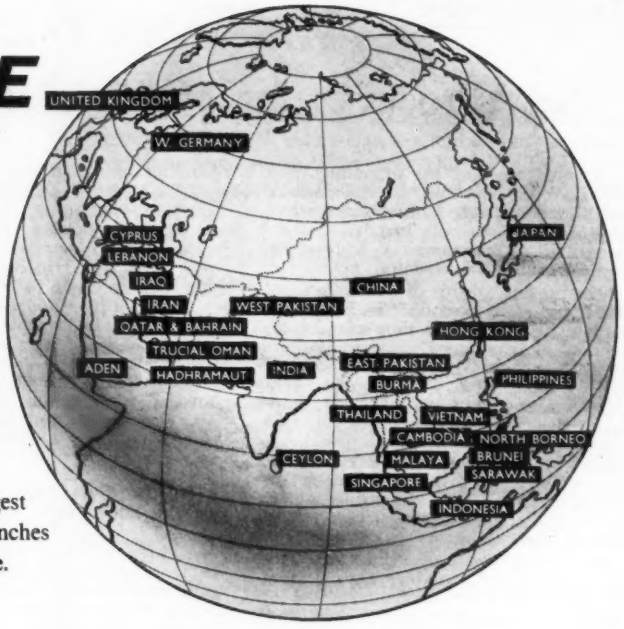
Growing use of air for blending, transporting and bin filling. Air is now being used in mill bins to achieve blending fluidisation, securing more uniform mixing. One would imagine, however, that large differences in specific gravity of constituents would make the system unacceptable in certain industries. Pneumatic conveying is also on the increase.

Lowering moisture content of filter-cakes. This is being achieved in a new development by the so-called "blotter" filter. In the experimental model, the filter cake, dewatered as far as is practicable in the conventional manner, is passed onto



The Krebs Centrifugal Sand Separator

EXPORT DRIVE



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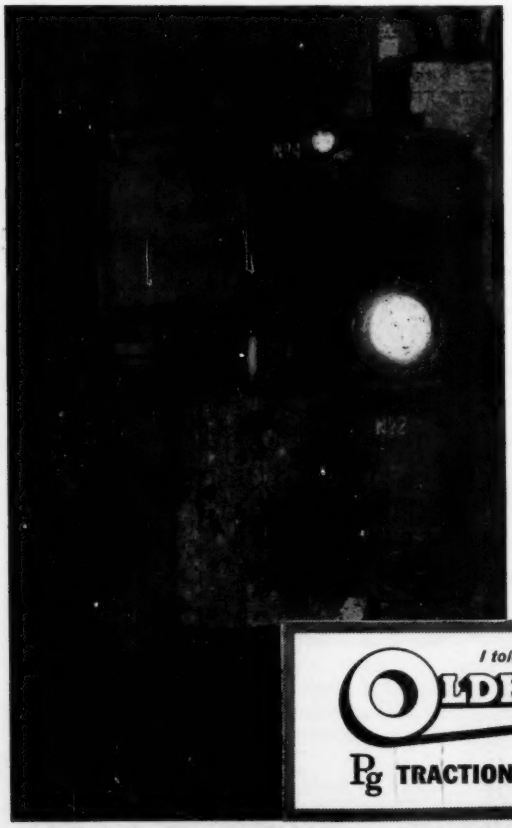

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a belt composed of a new type of tough, flexible but highly porous material which absorbs further moisture during the transit of the cake over the belt. The belt is then dried before returning to receive new feed.

Comminution. Electrically-induced thermal shock is being studied at Leeds University. In rocks with some conducting properties a conducting channel can be established between electrodes with comparative ease. Heat builds up with low frequency input until the expansion causes breakage. Research with additives in conventional grinding shows benefits in some instances and the reverse in others.

Colour as a means of separation. The use of colour as the intelligence for making a separation is to be explored at the Mines Branch, Ottawa, using equipment which will scan a particle from four directions and will reject it if the background is not matched in any one or more of the four directions.

It is possible to select any one colour or shade of colour, and particles from ¼ in. to about 10 mesh may be handled. Early tests are reported to have made good separations of light green talc from darker green chlorite, light gypsum from dark shale, with considerable promise shown in cases where the shade difference is quite delicate.

EFFECT OF TEMPERATURE ON COAL FLOTATION

It has been shown in investigations carried out by the U.S. Bureau of Mines that flotation recoveries were markedly affected by temperature variations when certain reagents, particularly simple aliphatic alcohols, were used. On the other hand, with other reagents, particularly kerosene, flotation is substantially independent of temperature changes and furthermore, with the reagents tested, there is little effect on the selectivity of separation. This is contrary to work which has indicated that the contact angle definitely changes, and the work of Bailey and Whelan in this country which indicated that there was a pronounced influence in batch flotation tests. It would appear that bubble formation and attachment are probably largely dependent on physical factors.

USING CHEMICALS TO CUT WATER LOSS

How American Smelting and Refining Co. recently sealed the bottom of two 275-ft. dia. tailing thickeners at the new Mission mine, to cut water loss by percolation into the compacted soil bottom, is described in a recent issue of *Mining World*.

Mission is Asarco's new copper mine and flotation mill south of Tucson, Arizona, where water is both scarce and expensive. The thickeners were treated with SS-13, a chemical which retards the flow of water through soil by decreasing void space between particles, which increases the ionic attraction of such particles to water. This enlarges the hydroscopic envelope of water around each particle to form a nearly impervious layer. When the first thickener was filled with 20 in. of water, an estimated 3,500,000 gallons, it was calculated that 1,285 gallons per minute percolated into the compacted soil bottom. This was approximately 3.5 cu. ft. of water per sq. ft. of wetted area per 24 hours.

A laboratory test by the SS-13 Sales Co., of Phoenix, Arizona, indicated that conditions were favourable for chemical treatment—sandy-type soil in contact with water containing only moderate amounts of calcium and magnesium salts. A small "on the job" drum test made in the bottom of the thickener confirmed laboratory tests, and it was decided to treat the new thickener before any tailing was placed in it.

The first thickener was treated with 3,500 gallons of SS-13. Water loss was cut to 100 gallons per minute 96 hours after treatment. This is about 0.3 cu. ft. of water per minute per sq. ft. of wetted area.

DENSOMETER CONTROLS GRINDING CIRCUIT

At Asarco's Silver Bell mine, a straight tube densometer is used to control the primary grinding circuit.

The unit, a Halliburton instrument, weighs the pulp confined in a hollow tube or more strictly a tube in which two centre sections are supported by flexible connections and the depression is conveyed to a secondary beam supported by a bellows. Any such movement brings a flat nearer an outlet air nozzle, restricting the discharge and so creates a change in the air pressure fed to the bellows. In this way, the bellows applies a force to the hollow beam which is proportional to the weight of pulp and, consequently, the beam is continually balanced to maintain an equilibrium. A pressure gauge on the air line records the pulp density or the variation in pressure can be employed to control rate of feed to the grinding circuit. The air signal ranges from 3 to 15 p.s.i. within 0.5 per cent and accuracy time is two seconds.

DISSOLUTION OF ZINC FROM SPHALERITE

It has been shown that it is feasible to extract zinc from zinc sulphides by leaching at elevated temperatures and pressures using either acid or ammoniacal solutions in the presence of oxygen. Although greater pressure is used with ammonia, corrosion is slight and the leach solutions are not as highly contaminated by impurities.

Using sphalerite concentrate, it was found necessary to add either pyrite or sulphuric acid (0.125 and 0.25 lb. per pound of sphalerite respectively) whilst oxygen must also be available and all three phases intimately mixed.

About 96 per cent of the zinc was extracted in one hour at 200 deg. C. when the oxygen partial pressure was 75 p.s.i. Leaching in the presence of air is almost as complete as when oxygen is used.

With ammoniacal leaching, no sulphate is required and oxygen must be used. The residues consist principally of hydrated limonitic iron oxides, hematite and basic ferric sulphate and contains practically all the lead and precious metals.

PROCESSING BERYLLIUM ORES

Mineral Concentrates and Chemical Co. Inc. at Loveland, Colorado, have disclosed the basic outline of their processing. High-grade ores are not upgraded by conventional means but lean ores are ground and treated by flotation, to raise the grade to between 15 to 30 per cent BeO after grinding to pass 200 mesh.

Richer ores are ground to 320 mesh without any concentration. Both are dried, mixed with sodium carbonate and sodium fluoride and pelletised. These pellets are fused in a sintering furnace at 7,750 deg. to 1,800 deg. F., cooled, crushed and the beryllium dissolved when water and hydrogen peroxide are added. After filtration and clarification, impurities are separated and finally beryllium hydroxide precipitated by the addition of sodium hydroxide. Further purification involves resolution in nitric acid and beryllium purified again by precipitation by ammonia and the process repeated to obtain the required degree of purity before final calcination yielding beryllium oxide.

ANALYSIS OF SAMPLE DATA FOR ESTIMATING ORE

In 1953 the U.S. Bureau of Mines began a research project in sampling, investigating sampling methods and the use of statistical analysis. Although some work has been published previously a report (RI 5835 by S. E. Hayen) is well worth studying.

UNDERGROUND ORE WASHING

The large amount of water in the underground workings and the nature of the ore at the Bancroft Mine combines to produce mud which is extremely difficult to control at loading points and during transportation.

To overcome this difficulty, some of the surface washing plant has been removed and installed underground. This removes fines and slime before the ore passes into the shaft loading pockets and the resulting slurry is screened so that only −3/16-in. material is pumped to surface, where it is classified into a sand and slime fraction. The sand fraction is filtered and conveyed to the grinding plant whilst the slime passes direct to thickeners and thence to the flotation plant.

TANTALUM IN CHEMICAL PLANTS

Lack of suitable materials has been known to prevent the large-scale use of some new chemical processes already proved effective in the laboratory. One of the most promising materials considered so far is tantalum. Metallurgists at the Amsterdam Laboratory of Royal Dutch/Shell are studying methods of using tantalum as liners for large pressure vessels, for if it were employed as a thin internal coating the cost would not be prohibitive. Tantalum presents several difficulties, however, not the least of which is that it cannot be welded in the presence of air because in this circumstance it becomes brittle. Also, welding it to other materials, like steel, results in an imperfect bond.

To overcome the problem of making tantalum welds in air, Shell engineers have adapted techniques of welding it in an inert atmosphere of argon, similar to those used for welding titanium. More accurate control of the welding condition is, however, necessary, because tantalum has a melting point of about 5,425 deg. F. and a strong tendency to warp. Jigs and fixtures are used so that the back of the weld can be protected with argon and warping is prevented. Special techniques are also being developed for the attachment of tantalum liners to steel vessels.

MINING MISCELLANY

New Canadian Iron Ore Smelters.—According to an official of the Quebec South Shore Steel Co., negotiations between two groups for a $30,000,000 iron ore smelter planned for the south shore of the St. Lawrence River, downstream from Montreal, have reached an advanced stage and financing arangements should be completed shortly. The project envisages the smelting of iron ore extracted from mines near Hull (Quebec) by the Udy process. The Swiss-controlled St. Lawrence Cement Co., with plants in Quebec, Toronto and Ontario, has plans for a similar iron ore operation to be established near Kingston (Ontario).

Pakistan Research Activities.—Among the projects outlined by Dr. S. Siddiqui, chairman of the Pakistan Council of Scientific and Industrial Research recently, is a long-range investigation of the direct reduction of low-grade Kalabagh iron ore with the help of Sui gas. It has been found that when the reduction is carried out after breaking down the iron clay complex (chamosite), through a process of recasting under specific conditions, sponge iron is obtained with a high yield. Pilot plant investigations are now proceeding, in association with a German iron and steel concern.

Using Sardinia's Lignite.—A bill for a long-term economic development programme for Sardinia has at last come before the Italian Senate. It is believed that it will be rushed through Parliament and will become law not later than the end of next February. Meanwhile several major projects are already well under way, including a thermo-electric plant of 2,500 kWh capacity to utilise low quality lignite. Sardinia's annual output of unrefined lignite is in the region of 1,200,000 tonnes and will probably be increased.

Indian Manganese Ore for Japan?—Fuji Iron and Steel Co., the well-known Japanese firm, is having talks with other Japanese ferro-alloy manufacturers for the import of 40,000 to 50,000 tons of manganese ore from India through the State Trading Corporation. India may import 10,000 tons of steel sheets, in return, if the bartar deal is approved by the Japanese firms concerned.

Mexican Ore in Colima.—An extensive iron ore deposit, said to contain at least 100,000,000 tons of iron ore, has been discovered near Pena Colorado, in western Colima State, Mexico.

New Chilean Steel Factory.—Armco Chile, a company formed by the U.S. Armco International Corporation and Compania Electro Metalurgica, has opened a plant near Concepcion to produce steel balls for milling or crushing ores. Steel used will be from the Huachipato mill, and the output will supply the needs of the copper mining companies and general national requirements eventually, although initial output will be 18,000 tons a year. It is estimated that this factory will effect an annual saving on import expenditure of about $U.S.5,000,000.

Nickel Find in Madagascar.—Nickel is reported to have been found in the Moramanga district of Madagascar, east of Tananarive, in deposits extending probably as far as Lake Alactra. An iron ore reserve of over 30,000,000 tonnes is also reported in the same area, as well as a number of small bauxite deposits, the largest being only some 4,000,000 tonnes of ore, but apparently of good quality. Large water reserves in the neighbourhood of the Moramanga nickel deposit would enable the ores to be processed on the spot.

It has been announced that the 944A wheel Traxcavator is now in production at the Glasgow plant of Caterpillar Tractor Co. Ltd. The 2 cu. yd. 944A is the latest addition to the growing range of Caterpillar equipment built in Britain, and is the second largest of the new wheel loaders introduced by Caterpillar in the United States last year

Boom in Missouri.—Over 16 major mining companies are reported to be spending millions of dollars annually in Missouri on exploration, nearly all in the south eastern quarter of the state, in an area bounded on the north by Sullivan, on the south west by Eminence, and on the east by the Lead Belt. About 50 geologists are working on scientifically-planned programmes in the largest mineral exploration schemes the state has ever seen.

Nickel Smelter Project for Sulawesi.—The Indonesian Government is reported to be envisaging the construction of a nickel smelter in Sulawesi near the Maniang mines. The intention is that ore of about 66 per cent purity would continue to be exported to Japan, the lower grades being refined to meet local industrial needs.

Developing Phosphates in Idaho.—An agreement to develop phosphate reserves in Idaho estimated at 50,000,000 tons has been announced by International Minerals and Chemical Corporation and Husky Oil Co. IMC, the world's largest independent producer of food-producing minerals, has extensive phosphate mining and processing operations in Florida. The reserves in Idaho, owned by Husky, are situated near Soda Springs, and constitute one of the largest known deposits of surface mineable phosphate ore in the U.S.

Katanga Tin Area.—A recent announcement by the United Nations states that a large part of Katanga, including the tin mining centre of Manono, is now in the hands of a Balubakat administration which is loyal to the Central Government.

Mineral Discoveries in Sierra Leone.—Substantial progress was made by Mr. P. K. Hall in his survey of Sierro Leone's alluvial diamond fields, which was started towards the end of 1958, states the Geological Department in its report for 1959/60. An investigation of the molybdenite mineralised area near Dalakuru was carried out by diamond drilling and geochemical prospecting. On the economic side, however, the most important achievement was the discovery of good grade bauxite in the Mokanji Hills (see *The Mining Journal*, Sept. 1, 1961, p. 216).

Study Course by Corrosion Group.—A vacation course on "Cathodic Protection—Instrumentation Interference, and Interference Testing" (organised with the co-operation of the Corrosion Group of the Society of Chemical Industry) is to be held by the Department of Metallurgy, Battersea College of Technology, London, S.W.11, on December 19 and 20.

Bulgarian Mineral Output.—Official figures published in Sofia give production during the first nine months of 1961 as: coal, 13,590,000 tonnes (6 per cent higher than in the same period of 1960); pig iron, 123,000 tonnes (34 per cent higher); electrolytic copper, 11,000 tonnes (11 per cent higher) and zinc, 19,000 tonnes (123 per cent higher).

Pakistan Coal Output.—A number of coal production units are being set up in West Pakistan by the Pakistan Industrial Development Corporation, and also by private owners of mines, to increase output and achieve the second five-year-plan target of 1,500,000 tons annually.

New Indian Copper Projects.—The Indian Planning Commission has given high priority to the Khetri and Kho Dhariba copper projects in order to save foreign exchange. Both projects will be undertaken by the National Mineral Development Corporation, and detailed reports are expected next March. At the Khetri mine, it is planned to have a concentrating plant and smelter, with an annual capacity of 10,000 tons of copper. the project to cost about R100,000,000. The Khetri reserves are estimated at about 28,000,000 tons of copper ore. In the Kho Dhariba deposits in Alwar district, an area of about two sq. miles has already been explored. The ore is stated to be richer than that of Khetri. The Dhariba project will consist of a mine and concentrating plant, estimated to cost R25,000,000, with an annual output of about 15,000 tons of copper metal. The question of constructing a railway line from Chirawa station to the Khetri site is under consideration by the railway board.

Canadian Copper Discovery.—Canadian Dyno Mines reports the discovery of a copper bearing structure, about 70 miles east of James Bay and 260 miles north of the Mattagami Lake mines in northwest Quebec. The deposit is stated to be on claims held by the Duncan Range Iron Mines, and Canadian Dyno holds options which would, if exercised, give it over 75 per cent of the issued capital of Duncan Range. Canadian Dyno also owns various claims in adjoining territory. Samples from the deposit reported the copper-bearing structure as assaying 4.3 to 23.8 per cent copper and 0.36 to 5.22 ounces silver.

Japanese Industrial Mission. — A Japanese industrial mission, led by Mr. Hcroshi Shio recently visited Panjim (Goa) to study possibilities of mechanising ore mines belonging to a Goan firm. While in Goa, the mission held negotiations for a large supply of Goan iron ore to the Japanese steel industry.

Polish Coal Exports.—Poland exported 12,150,000 tonnes of coal during the first nine months of 1961, about the same as in 1960. The coal was shipped to 32 countries, about half of which were Iron Curtain countries. Among non-European customers this year were Cuba, The Canary Islands and Aden.

West German Coal Industry.—Coal production in West Germany totalled 12,600,000 tonnes during October (11,170,000 tonnes in September), and coke amounted to 3,120,000 tonnes (3,030,000). Pithead stocks were 7,550,000 tonnes of coal and 4,449,000 tonnes of coke. The number of workmen, at 415,000, was 1,700 fewer than in September, but output per man-shift rose from 2,198 to 2,211 kgs. Ruhr coal mines expect sales to drop by about 5,500,000 tonnes during 1961, compared with 1960, although production is expected to be 600,000 tonnes higher. The electrification of the Federal Railways accounts for much of the drop.

Polish Zinc and Aluminium Output.—During the first half of 1960, about 90,600 tonnes of zinc were produced in Poland, just over the target planned, and 104.1 per cent more than in the first half of 1960. Over the same six-month period, Polish aluminium output reached 23,500 tonnes, 105 per cent of the planned figure and over twice as much as that for the first half of 1960.

Longer Drill Steel on Rand

An important contribution to longhole drilling practice in the South African mining industry was the starting up in July of this year of what is believed to be the largest steel carburizing furnace in the world at the Avesta S.A. works at Krugersdorp. Judging by current experiments, longhole drilling where conditions are suitable, will be used to an increasing extent in concentrated stoping methods required in deep, hot mines (see page 567).

Avesta S.A. have recently introduced a new high quality material under the code name of Group 20. This has already aroused interest in the mining and metallurgical spheres, for it is reported as likely to play a significant part in improving the fatigue life of drill steel. With the installation of the new furnace and equipment, these improvements can now be extended to any length of rod that can be rolled by the steel manufacturers.

The electrically heated, gas carburizing furnace itself is a Wild Barfield vertical pit type, operating at a maximum temperature of 1,050 deg. C. and with a rating of 235 kW. in three equal zones. Constructed of Nimonic 75, the retort within the furnace has a batch capacity for charging more than 6 tons at a time.

Avesta steel is marketed in South Africa by Holman Bros.

Bastar's Iron Ore deposits.—Dr. K. N. Katju, Chief Minister of Madhya Pradesh, said in Bhopal recently that the iron ore deposits in the tribal district of Bastar had been adjudged to be the best available in India by a team of Japanese experts. Inaugurating a five-year plan week under the auspices of the planning forum of the Government post-graduate Hamidia College, the Chief Minister said that a 400-mile railway line to Vizagapatnam would be laid to facilitate export of iron ore to Japan from Madhya Pradesh.

Large Silver Reserves in Pakistan.—Silver deposits, claimed to be among the biggest in Asia, have been discovered in West Pakistan. The reserves are reported to contain a silver seam of some 4¼ ft., and to extend for over 12½ miles.

Indonesian Aluminium for Japan.—According to the Japan Light Metal Refining Industry Association three Japanese aluminium producers plan to import a total of 1,200,000 tonnes of bauxite from Indonesia during the next three years. It is understood that the bauxite will come from reserves on Bintan Island.

French Iron Ore Company.—The French company, Forges et Acieries du Nord et de l'Est has extended its iron ore concession in the Briey Basin in France, thereby considerably extending its reserves. It is understood that the new site will be exploited both by this company and by Societe des Mines de Fer de Saint-Pierremont.

Chilean Iron Ore Output Up.—Some 1960 figures recently published by the Chilean Ministry of Mines show that iron ore production has doubled during the past ten years, and has increased twenty-times the 1945 figure. In 1960, iron ore production was Chile's second mining activity, nitrates holding first place. Coal reduction fell sharply in 1960, chiefly owing to a three-months' strike, and some imports were necessary.

Swaziland Barytes Output Down.—According to the Geological Survey and Mines Department, production of barytes in Swaziland totalled 200 s.tons in 1960, compared with 461 s.tons in 1959. The decreased output last year was due to weak market demand in the Republic of South Africa, the sole consumer. Swaziland Barytes, Ltd. whose Londosi mine is situated N.E. of Oshoek near the Transvaal border, is Swaziland's only producer of this mineral. Recent drilling by the Geological Survey indicated a reserve of 1,081,000 tons in four veins, with vein widths ranging between 10 and 49 inches.

Great Lakes Shipments Down.—Iron ore shipments in October rose more than a million gross tons, compared with the October 1960 figure, but the total of shipments for 1961, at 57,611,568 gross tons was over 10,000,000 tons lower than the figure for the same period in 1960. Coal hauled from Lake Michigan and Lake Erie ports in October totalled 5,755,465 net tons, compared with 6,309,280 tons in October 1960. The total coal shipments for the year to November 1 were 37,291,905 net tons compared with 40,362,047 tons in the same period of 1960.

Thai Ore for Japan.—The first shipment of iron ore from Thailand is being exported to Japan. A tentative contract for 30,000 tons has been negotiated, and it is expected that Thailand would ship about 200,000 tons to Japan annually.

Steel Plan for Kuwait ?—A West German company has been commissioned by the Kuwait Ministry of Finance to investigate the possibility of establishing a steel industry in Kuwait which would use ore from India and local natural gas.

Coking Coal in the Urals.—Coking coal is reported to have been found in the Urals—a discovery of considerable importance to the local Russian metallurgical industry. The reserves there are estimated at between 40,000,000 and 50,000,000 tons.

U.S. Grant to Study Low Grade Ore.—The Area Redevelopment Administration of the U.S. Department of Commerce has announced a $65,000 technical assistance project to test low-grade, non-magnetic ores from the western Mesabi Range, to determine their possible use for iron and steel production. This sum will augment a $77,500 investment by the Minnesota Iron Range Resources and Rehabilitation Commission for tests of other low-grade non-magnetic ores. The technical assistance project was requested earlier this year by the Itasca Area Redevelopment Agency, Minnesota. Fried Krupp Works, of Essen, W. Germany will conduct the testing of the low-grade ores. In addition to the Federal and State funds, three private firms are contributing services estimated at over $20,000 to help complete the tests.

Angola's Diamond Exports.—According to figures published in Lisbon, diamond exports from Angola during the first half of 1961 rose to 773,104 ct. valued at 399,000,000 escudos compared with 503,115 ct. worth 280,000,000 escudos in the corresponding period of last year. Most of the diamonds went to the U.K.

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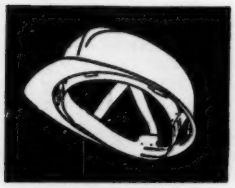

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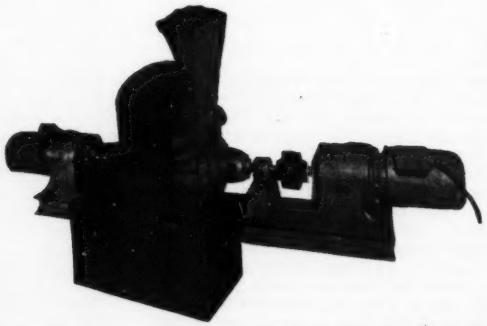

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HINDUSTAN STEEL'S COAL WASHERY PROJECT

The Dugda coal washery, a Hindustan Steel project, is expected to go into operation by December this year. Work on the setting up of this plant, capable of washing 600 tons of coal per hour, was begun two years ago. The washing unit and despatch section will be ready shortly for trial run. Preliminary trials were held in August last. When running at full capacity the washery will receive 400 wagons of coal daily from about 26 collieries and the clean coal will be sent to the public sector plants at Rourkela and Bhilai.

The total cost of the project, including the township, is R69,600,000, which includes R24,300,000 payable in dollars. The total capacity of the plant is 2,444,000 tons of raw coal or 1,700,000 tons of washed coal per annum, at 16 working hours a day and 300 working days per year. The raw coal, when washed, will provide 70 to 71 per cent middlings and 7.5 per cent rejects which will be mixed in the ratio of 3:1 and sent to the Chandrapura Thermal Power Station for consumption.

Hindustan Steel has also two other washery projects on hand. The first, Bhojudih coal washery, will supply coal to the steel plants of The Tata Iron and Steel Co. and is expected to be ready in May, 1962. This washery will have a capacity to wash 300 tons of raw coal per hour and will cost R18,200,000 excluding the cost of township. The foreign exchange component is about R10,300,000.

The third washery at Pathardih will cost about the same as the Bhojudih project and will have an annual capacity of 2,000,000 tons. The construction of this project is expected to be completed by June, 1963.

HEAVY MEDIA SEPARATION PLANT

G.E.C. (Engineering) Ltd. has received instructions from Colvilles Ltd. to proceed with the manufacture of a heavy media separation plant at a cost of £20,000. This plant will be installed at a small mine at Blanchland, Co. Durham for upgrading fluorspar. The mine is operated by Blanchland Fluor Mines Ltd., a wholly-owned subsidiary of Colvilles Ltd., and supplies metallurgical grade fluorspar to the Ravenscraig steelworks.

Jigs and concentrating tables are used in the existing plant for upgrading the fluorspar but the jigs are to be replaced by the G.E.C. heavy media separation plant. This is the company's standard H.M.S. system with slight modifications to suit the particular conditions, and it will be able to handle a feed of 12 tons per hour from the existing crushing plant.

A 5 ft. dia. conical separator vessel is to be incorporated in the plant and it will be fitted with a tubular steel agitator frame having non-return air valves which are used for re-activating the ferro-silicon medium. The slurry pumps, medium recovery system, and Eliptex screens for feed preparation, sink and float drainage, and dewatering are all included in the G.E.C. contract.

It is intended to use the froth flotation equipment to produce an acid grade fluorspar from the −25 mesh fines which will be removed by the feed screen ahead of the H.M.S. cone, and from the $-\frac{1}{16}$ in. float fraction of the H.M.S. plant.

PUBLICATIONS RECEIVED

A survey of the Gunflint iron range, entitled *Gunflint Iron Range in the Vicinity of Port Arthur*, by W. W. Moorhouse, had as its objects a re-examination of the iron formation, and an appraisal of the area as a possible source of direct-shipping or concentratable iron ore. The results of this work, together with a report by A. M. Goodwin entitled *Gunflint Iron Formation of the Whitefish Lake Area* are published together in Vol. 49, Part 7 by the Ontario Department of Mines, with eight maps of the area. No new indications were found of commercial concentrations of ore likely to be profitable under present conditions. Some interesting stratigraphic and structural relationships have developed from the mapping programme and are summarized in the report.

★

Geophysical Abstracts 180 *and* 181 of the U.S. Geological Survey, Bulletin No. 1116, A & B, are now available for the first six months of 1960. These abstracts of current literature pertaining to the physics of the solid earth and to geophysical exploration, may be obtained from the U.S. Government Printing Office, Washington, 25, D.C. Price 40 cents each copy.

★

Scientific notes and summaries of investigations prepared by members of the Geological Division in the fields of geology and allied sciences, are published in a volume entitled Geological Survey Research, 1960, headed *Short Papers in the Geological Sciences*. Available from the U.S. Government Printing Office, Washington 25, D.C., Price $4.25 (paper cover).

★

U.S. Geological Survey Bulletin No. 1085-B, *Botanical Prospecting for Uranium in the Deer Flat Area, White Canyon District, San Juan Country, Utah* has been prepared on behalf of the U.S. Atomic Energy Commission, and is published with the permission of the Commission. This is part of a programme of botanical prospecting for uranium in the Colorado Plateau. The report, by A. J. Froelich and F. J. Kleinhampl, finds that botanically defined anomalies occur at all major known deposits at Deer Flat, the distribution of occurrences suggesting that the south half of the area is much more favourable for concealed uranium deposits than the north. Additional physical exploration is recommended to test the validity of the plant-analysis method.

★

Volume 85 of the Memoirs of the Geological Survey of India, has now been published; it covers *Bauxite in Bihar, Madhya Pradesh, Vindhya Pradesh, Madhya Bharat and Bhopal*. The author is M. K. Roy Chowdhury, M.Sc., D.Phil. Obtainable from the Manager of Publications, Geological Survey of India, Delhi. Price 28s. 6d.

★

The seventh edition of *Overseas Newspapers and Periodicals Guide Book* produced by the Publishing and Distributing Co., price 30s. lists over 3,000 publications, with data on each, under country and subject matter. Publications dealing with mining, metallurgy and allied subjects in all parts of the world can be easily located.

Mr. David Brand, Premier of Western Australia, states in his foreword to *Titanium—Look to Australia* "We have a high regard for the contribution being made by the beach sand mineral industry, in which Western Titanium N.L. is a major primary producer. In this attractively produced booklet, Western Titanium have given the story of ilmenite—from the earth to the consumer. Typical analyses are given for specimen samples of monazite, zircon, rutile and leucoxene with information on their uses. A novel feature is the inclusion of actual samples of the various products, which are attached to the inside back cover. This lavishly illustrated booklet may be obtained from the company's head office in Melbourne or from any of their overseas marketing representatives.

★

The 1961 edition of the *Canadian Mining Manual*, now available from National Business Publications, Gardenvale, Que., once again provides a variety of information on the Canadian mining industry. Under the various sections, exploration, mining, milling and metallurgy, engineering and administration, experts from all over the world have contributed articles of topical interest. Included in its 276 pages is an index of machinery supply and service companies, and a classified index of equipment and supplies.

★

The appreciative reception accorded to the first edition of *Minerals for the Chemical and Allied Industries* has led to the preparation of a revised and enlarged edition by the authors, S. and M. Johnstone. This book gives a concise account of the sources, occurrence and methods of treatment of all industrial minerals and products derived, as well as much other information on their commercial use. New chapters have been added on many minerals not previously included, and much information previously on the "secret list" has now been released. Each section has therefore been carefully edited, and, where necessary, chapters entirely rewritten. Comprehensive bibliographies are included, and the book, price £7 7s., is published by Chapman and Hall.

★

Climax Molybdenum Co., a division of American Metal Climax, has made available on request a new 60-page booklet entitled *The Role of Molybdenum and Copper Corrosion Resistant Steels and Alloys*, designed to assist the selection of the proper alloy for the specific performance required.

★

In a foreword to *Handbook on Quarrying*, published by South Australian Department of Mines, the Minister of Mines, Sir A. Lyell McEwin writes "The rapid expansion of various quarrying operations in South Australia over the past decade is a reflection of the importance of rock products in the State's industrial expansion." This handbook, written to assist the quarry operator —particularly the non-technical man, has been compiled by Mr. L. L. Mansfield (Inspector of Mines and Quarries) as a guide on the correct lines of procedure in opening up and working surface mineral occurrences. Price 7s. 6d.

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Metals and Minerals

Why the Americans Want a World Aluminium Agreement

The American aluminium industry's proposals for a voluntary international agreement to regulate world imports, briefly reported in our issue of November 17, were primarily instigated by concern over growing foreign competition. The authors of the proposals, a committee of representatives of the three big producers, Reynolds Metals, Aluminium Co. of America, Kaiser Aluminium and Chemical Corporation and representatives of U.S. smelters, die casters and distributors, have called for negotiated imports on a flexible quota basis in order to "rationalize international trade in aluminium products". Secondly, they state that the American industry is prepared to work closely with other countries to increase the free world's consumption of the metal and its products by developing new and expanded markets.

What has clearly worried American fabricators and distributors is the rising trend of imports of aluminum products over the past few years, for instance, it is pointed out that from 1957 to 1961 imports of sheet aluminium have jumped 120 per cent, foil 179 per cent, rods and bars 126 per cent. These so-called "disproportionate" imports are said to have skimmed off the cream from the American market.

The American aluminium industry as a whole, however, is far more concerned about the expansion of the aluminium industry in W. Europe. In fact, the entire proposals put forward by the American aluminium interests must be read in a context of current over-capacity in the free world and W. Europe's avowed aim not only to produce domestically all the aluminium that it will need but also to challenge U.S. fabricators in their own markets.

Up to 1939 W. Europe was the world's biggest aluminium producer but during the war N. America took the lead and has held it ever since. However, by 1960 W. Europe had climbed back to third position in world production with a 19 per cent share against N. America's 54 per cent, and compared with the N. American continent her rate of growth is considerably faster. It is small wonder that the U.S. industry, despite the powerful stakes it already has in Britain and W. Europe should want to strengthen them even further, and what better tactic suggests itself than to promote a series of international industry-government conferences to establish, in Mr. Lipkowitz's words "an orderly pattern of marketing of aluminium and aluminium products, in the U.S., Europe, Japan and other parts of the world".

So far the American industry has only had discussions with the U.S. Commerce Department, and it remains to be seen how the White House will react to the proposals. While there have been signs that the Kennedy Administration is taking a more favourable view of international commodity agreements as price stabilizers, the aluminium industry's proposals come up against the anti-trust laws.

Anticipating these obstacles, Mr. Lipkowitz, chairman of the industry's committee, said that the proposals would not constitute a cartel since their purpose, besides introducing an orderly pattern of marketing, is to increase the production and consumption of aluminium, whereas cartels are designed to hold capacity to consumption. The proposed world agreement, he said, would not set a finite limit to aluminium imports and aluminium products into the U.S. because foreign suppliers would participate in the growth of the American market brought about by higher consumption.

In any event, there seems little doubt that unless the American industry can make out its case in the much wider context of the economic and political interests of many developing countries there appears to be little chance of its overcoming the constant opposition of the anti-trust watch dogs in Washington. Moreover, while the industry's proposals have specifically referred to the long-term aim of promoting the consumption of aluminium, the U.S. fabricating interests had nevertheless better reconcile themselves to the fact that the location of ingot production and of fabricating will become increasingly localized as cheap sources of thermal power become more widely available, notably through the increasing availability of natural gas. In such circumstances it is, to say the least, unlikely that aluminium producers in the rest of the world will show any enthusiasm for these American proposals.

U.S. FREE MARKET IN SILVER PLANNED

President Kennedy has directed the Secretary of the Treasury to suspend further sales of free silver. Technically this means the immediate repeal of the Silver Purchase Act which requires the Government to sell silver at 91 c. an oz. Until now this has effectively fixed the price at which silver producers could sell in the open market. At the same time the President announced plans for the eventual demonetization of silver.

The issue of free silver held by the Treasury for coinage has been suspended and this demand will instead be met by drawing on silver now committed to the support of $5 and $10 certificates which will be retired in favour of Federal Reserve Notes. The Government holds about 1,700,000,000 oz. of silver for the support of the $5 and $10 bills.

The U.S. Government's stock of "free silver" fell by 52,000,000 oz. last year and further declined from 124,000,000 oz. last December to 22,000,000 oz. this week.

While the suspension of the U.S. Treasury sales of free silver is bullish, it is nevertheless accompanied by some far from bullish developments and uncertainties, namely the gradual release, for U.S. subsidiary coinage, of nearly 500,000,000 oz. silver, which is at present backing the $5 and $10 silver certificates and the recommended similar release of about 1,200,000,000 oz. which is backing the $1 silver certificates.

The eventual demonetization of these silver bullion reserves, even if only for U.S. subsidiary coinage, is not bullish. In short, the U.S. Treasury has not only removed the supply which was holding down the price, but it has also removed a demand, namely its own coinage demand, of about 40,000,000 oz. a year. Retirement, as they wear out, of the $5 silver certificates alone will cover the Treasury's coinage needs for more than 10 years. Throughout that period it will not need any of the current silver output. If Congress permits the similar retirement of the $1 silver certificates, the whole operation would provide the U.S. Treasury with an additional 1,742,000,000 oz. silver, enough to meet its coinage purposes for the next 25-30 years.

BOLIVIA AND WOLFRAM PRICES

The Bolivian National Commission of Mining Operations Studies alleges that the drop in international wolfram prices to 96s. per long ton unit has been caused principally by Russian "dumping", while Chinese wolfram is also reaching the market at lower prices.

If the price dropped further to 80s. before recovering, as the Commission believed likely, this would mean closing all wolfram mines in Bolivia and the rest of South America.

*

A further, but much less, easing in wolfram ore shipment prices has been reported. Dealers are now indicating 89s. to 93s. per long ton unit C.I.F. Europe, compared with 90s. to 95s. previously.

A fair amount of business chiefly, it is thought, on Continental account has matured at the lower levels.

QUICKSILVER PRICE UNCHANGED

The price for quicksilver, ex-warehouse London, has remained quotably unchanged at £59 per flask since November 14.

Although domestic demand is still unimpressive, there have been some very good sales recently for re-export from the United Kingdom. In October, some 1,500 flasks are said to have been dispatched abroad, an exceptionally high figure, exceeding the 1,242 flasks, also a high rate, which went out in September. Chief recipients in October were France 550 flasks, Poland 500 and West Germany 250. A lot of the Russian metal which has come into the U.K. is believed to have gone out again.

As U.K. imports in October were not much more than 1,800 flasks, the quantity retained in the country was small. In fact, opinion in some quarters is that metal for prompt delivery ex-warehouse is not all that freely available at the moment, most of it being in strong hands. Even so, few at this stage seem prepared to be too optimistic about whether the market has at long last grounded after the progressively declining trend over the past year; possibly some little time will have to elapse before the outlook can be viewed with more confidence.

ANGLO-CANADIAN URANIUM TALKS

Talks in Ottawa between Canada's Trade Minister, Mr. Hees, and Sir Roger Makins, chairman of the U.K.A.E.A., on the sale of 12,000 tons of uranium oxide to Britain have been concluded. According to Mr. Hees, "some progress in a very difficult problem has been made", and there will be further talks. Sir Roger

Makins has returned to London with proposals which are expected to establish new prices and probably new delivery dates. The original agreement called for delivery between 1963 and 1966 at a price of $8 per lb. The new price formula will not be disclosed until it has been approved by the British Government, but it is expected to be in the region of $5. It has been calculated on the basis of cost of production of the six main producers, only the two smallest of which—Bicroft and Faraday would be unable to produce at well below this level. The proportion of the 12,000 tons allocated to Bicroft and Faraday would presumably be quite small.

KITIMAT'S MILLIONTH TON

Alcan's Kitimat smelter, which has been in operation for just over seven years, recently produced its millionth ton of aluminium. It started production on August 3, 1954. In the words of the company's president, Mr. F W.. Bruce, " only a few plants in North America and none in the rest of the world, have achieved this record in this period of time ".

PRICE OF GALLIUM CUT

Alcoa has announced reduced prices for all three grades of gallium, effective as from November 1. The greatest decrease —25 per cent—applies to large quantities of electronic-grade gallium. Improved facilities for producing gallium at Alcoa's Bauxite (Arkansas) works have made these price reductions possible. There has recently been a growing demand for gallium in the fields of electronics and metallurgy.

DEVELOPMENT OF INDIA'S MICA INDUSTRY

The Mica Export Promotion Council's proposals for the development of the Indian mica industry provide for the establishment of fabrication facilities with foreign collaboration, as well as for the training of Indians by Russian experts in both the subjective and objective methods of mica grading. Proposals for the establishment of a fabrication industry have not yet taken concrete form.

M.E.P.C., with the assistance of the Mica Industry Association in New York, has obtained a set of matched samples of Indian mica selected by the American Society for Testing Materials. These will serve as visual comparison standards in India.

The use of instruments for testing mica has been suggested by a member of M.E.P.C.'s advisory committee, who recently visited the U.S.S.R., where both the subjective and objective methods of examination are in use. Since the committee believes that instrument testing of performance characteristics of mica is more practical than visual methods, the Council has ben asked to explore the possibilities of inviting two Russian experts to India to train Indians in instrument testing methods.

S.W. AFRICA MANGANESE OUTPUT

S.W. Africa produced 6,779 tons of manganese during the third quarter of this year, against 22,016 tons in the second quarter, and 17,311 tons in the

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third quarter of last year, according to figures issued by the Inspector of Mines.

Exports in the third quarter totalled 17,622 tons and went to the United States and Norway. This compares with exports of 11,509 tons in the second quarter, which went to Belgium, and exports of 14,784 tons in the third quarter of 1960 which went to Spain and the United States.

Copper · Tin · Lead · Zinc

(From Our London Metal Exchange Correspondent)

Stocks in L.M.E. official warehouses at the beginning of the week are reported higher in the case of copper and lower in the case of tin, lead and zinc, a reversal of the position in previous weeks.

COPPER STOCKS RISE AGAIN

Copper stocks in L.M.E. official warehouses rose by 486 tons to 15,575 tons after falling consistently for the past two months. On the L.M.E., prices kept steady for most of the week but later fell by about £1 with a contango of 10s. to 15s. Market opinion seems to be that prices will remain around present levels in the absence of either adverse or favourable news.

In Santiago the chairman of the Chilean Copper Labour Confederation stated that some mine workers would probably be laid off because of increasing costs due to new government taxes. Anaconda, however, denied that there would be any lay-off of workers at Chuquicamata and El Salvador, adding that workers made idle at Potrerillos because the mine is at exhaustion point have been offered work at El Salvador. In the event, about 400 workers have been dismissed at Potrerillos, adding impetus to the dissatisfaction between workers and employers. Santiago also reports that the U.S. C. de P. Corporation has discontinued operations at Rio Blanco, where it was planned to open up a copper mine to produce 60,000 tons of blister copper annually. The Corporation states that it has been unable to reach a satisfactory agreement with the Chilean Government on taxation and other matters.

Ottawa reports Canadian production of copper in September as 37,346 tons compared with 34,554 tons in September, 1960; January/September production totalled 331,126 tons compared with 332,308 tons a year ago. From Salisbury the Central Statistical Office reports that Rhodesia and Nyasaland exported 47,100 tons of copper during August, compared with 43,400 tons (revised) in July and 48,400 tons in August, 1960; exports of copper concentrates during these months were 1,790 tons, 1,834 tons and 2,500 tons respectively.

In New York the Copper Institute has stated that U.S. fabrication in October declined by about 4,000 tons compared with September; refined stocks increased by a like amount, and new orders booked declined by about 11,000 tons. It is now thought probable that India has completed her purchases of copper under the U.S. Development Loan; total purchases are said to have been 9/10,000 tons. Copper sales by ENAMI for the account of small Chilean producers during the past week totalled 335 tons. In the U.K. electro wirebars for prompt delivery seem to be in tight supply, and appreciable premiums are being asked, up to £5 over the L.M.E. in the U.K. and even more on the Continent.

TIN WAITS FOR CONGRESS

Tin stocks in L.M.E. official warehouses fell by 71 tons to 4,275 tons. On the L.M.E. the prices of both cash and forward metal have fallen throughout the week and the contango widened to £12 to £13. Nevertheless there is an impression that the market is "sitting on the fence" awaiting news of U.S. intentions regarding releases from the strategic stockpile. U.K. consumers appear to be in no urgent need and if there is a shortage of supply it is likely to come somewhat later than had previously been thought likely. Some re-appraisal of the position would seem appropriate if demand in the U.S. continues to lag behind what had previously been expected.

The Malayan Government has announced that in October Malaya produced 4,906 tons of tin metal from concentrates, the second highest output this year. This figure compares with 4,580 tons in September. Washington has announced the sale by the G.S.A. of a further 650 l.tons of Longhorn Grade "A" and 25 l.tons of Longhorn Grade "B" tin, this from a total of 875 tons offered. Prices paid were rather better than expected as also was the tonnage sold judging by the behaviour of the London and New York markets during the past few days.

On Thursday the Eastern price was equivalent to £963¾ per ton c.i.f. Europe.

LEAD PRICES STEADY

Lead stocks in L.M.E. official warehouses fell by 191 tons to 11,428 tons. On the L.M.E. prices have kept steady at about £2 above the recent lowest level, which in any case was a 15-year low. The contango has remained steady at about 20s. to 25s. Demand for lead during the week appears to have been firmer and there have been indications of some temporary shortage of Commonwealth supplies. In some quarters it is felt that lead supplies may become more plentiful due to America's decision to withdraw silver from the U.S. monetary reserve and suspend sales. This American action is expected to cause a rise in the price of silver, thus allowing the silver/lead mines to increase production. If this should happen, the general reductions proposed by the Study Group would be likely to go by the board and prices would fall.

Canadian production of lead in September is reported as 19,077 tons compared with 16,759 tons in September, 1960; January/September production totalled 167,318 tons compared with 151,528 tons a year ago. From Salisbury it is announced that Rhodesia and Nyasaland exported 61,600 centals of lead during August, 30,400 centals in July and 39,900 centals in August, 1960. Paris reports that production of European O.E.C.D. countries totalled 67,180 tons (provisional) in October compared with 67,434 tons in September; stocks at the end of October amounted to 50,422 tons (provisional) compared with 57,990 tons at the end of September; production of lead ores and concentrates was 33,441 tons (provisional) in October compared with 34,702 tons in September. In Madrid the Metal Syndicate reports Spanish production of lead in October as 6,574 tons compared with 6,130 tons in September and 2,639 tons in October, 1960. Total production for the 10 months of 1961 was 63,315 tons.

In the U.S. the lead price was raised during the week to 10.25 c. per lb.

ZINC PRICES IMPROVE

Zinc stocks in L.M.E. official warehouses fell by 65 tons to 11,092 tons. On the L.M.E. prices have risen during the week by about 25s., whilst the contango has remained at about the same figure. U.K. demand for this metal has been rather better whilst prices have been kept steady by Continental activity, and the fact that the U.S. domestic position seems to be quite strong. Possibly recent low prices have discounted most known adverse features in the situation.

Canadian production of zinc in September was 38,926 tons compared with 34,997 tons in September, 1960; January/September production totalled 292,648 tons compared with 305,849 tons a year ago. From Salisbury is announced that Rhodesia and Nyasaland exported 42,900 centals of zinc in August compared with 41,000 centals in July and 56,100 centals in August, 1960. Refined zinc production by European O.E.C.D. countries is reported from Paris as 76,673 tons (provisional) in October compared with 77,684 tons in September; the October total being about 3 per cent more than a year ago. Stocks at the end of October amounted to 66,982 tons (provisional) compared with 75,090 tons at the end of September. Zinc ore and concentrates production in October was 47,576 tons (provisional) compared with 48,288 tons in September, the October total being about 11 per cent more than a year ago. In Madrid the Metal Syndicate reports Spanish production of zinc in October as 4,204 tons compared with 3,306 tons in September and 2,840 tons in October, 1960. Total production for the ten months of 1961 was 30,599 tons.

New York sources state that India has now bought about 3,000 tons of high grade zinc under the U.S. Development Loan; in all India is said to be looking for about 9,000 tons under the Loan.

OFFICIAL TURNOVERS

Official turnovers (in l.tons) for the week ending November 24, 1961, with the previous week's figures in parentheses, are :—

Copper	10,425	(12,750)
Tin	2,810	(1,880)
Lead	11,825	(12,250)
Zinc	8,500	(10,550)

Closing prices are as follows :

	November 23		November 30	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£229¾	£230	£228	£228¼
Three months ..	£229½	£229½	£228	£228¼
Settlement ..	£230		£228¼	
LEAD				
Current ½ month	£61¾	£62	£60	£60¼
Three months ..	£62¼	£63	£60¾	£61
TIN				
Cash	£960	£961	£949	£950
Three months ..	£967	£968	£960	£961
Settlement ..	£961		£950	
ZINC				
Current ½ month	£70	£70¼	£70¼	£70¾
Three months ..	£71⅛	£71½	£71⅛	£71½

London Metal and Ore Prices appear on page 589.

Mining Finance

A New Gold Mine?

Ever since the announcement of the result of borehole 21 last April there has been speculation about the Libanon area of the West Wits line. There now appear to be two possibilities, either a completely new mine or alternatively a considerable extension to the Libanon lease area. In his annual review to West Wits shareholders, published on page 590, Dr. Busschau points to the "possibility of establishing a new mine".

In the area to the south and east of Libanon and to the east of the V.C.R. sub-outcrop, three holes have been drilled so far. Borehole 21 gave 1,318 inch-dwts. on the first intersection and 3,101 inch-dwts. on a deflection. Borehole 24, drilled by Consolidated Gold Fields, has given 2,943 inch-dwts. on the first intersection and deflections are to be made at the V.C.R. horizon after the hole has been extended down to the Main reef series. In borehole 22 the V.C.R. had been eliminated by an igneous dyke.

The actual values obtained in these holes, whilst very encouraging, still represent a very small sample and the main value of the results is the confirmation of the continuance of the geological series as it is known at Libanon and the proof that the Witpoortjie fault is situated further east than had originally been anticipated. At present two further holes are in progress, No's. 23 and 25 and much will depend upon the results from these holes. If the results are similar to those of No's. 21 and 24 then it would appear that West Wits have hit the V.C.R. jackpot.

The other main area in which West Wits have been drilling during the past year lies to the west of Doornfontein. In this area the results have not been as spectacular but again the geological succession has confirmed that the economic horizons of the Main reef and the Carbon Leader are present in this area. Since the end of the financial year borehole E.8K has intersected the Main and Kimberley reefs and borehole E.8L intersected the Main and Carbon Leader reefs but in each case the values obtained were low.

The intensification of the drilling programme during the past year has meant that the expenditure on exploration has increased to R200,126 from R80,524. This additional expense has, however, been more than offset by the increased dividends received and excluding the non-recurring profit of R720,000 in 1959-60, which was due to the realisation of Western Deep shares, the net profit for the year has increased by R268,150 to R3,907,698. The annual dividend rate has been increased to 40 cents and Dr. Busschau has said that it should be possible to maintain this rate during the current year. On the current London price of 55s. this gives a gross yield of 7.2 per cent. The yield on Johannesburg is 6.0 per cent.

KEPONG NEARS THE END

Although the working profit for the year ended June 30, 1961, must be regarded as very satisfactory, Kepong is, in fact, nearing the end of its life. In his annual address the chairman, Mr. J. H. Rich, has estimated that the dredging area will be exhausted in about two years as from July last. This will not mean the stopping of all mining operations as the dredged ground will be opened to tributors. Already tributors are working on the property in areas unsuitable for dredging and during the year under review the revenue from this source amounted to £15,438.

Normally it should be a mining company's policy to return capital to shareholders when mining operations cease, although there are, of course, occasions when the conversion of a mining company into a minor finance house or an industrial investment company is definitely in the interest of shareholders.

If it is assumed that investors purchase mining shares qua mining; had they wished to invest in real estate or industrials there are plenty of opportunities without turning to "converted mining companies". When a mining company borrows money it is for mining, and when that operation is complete the full value of the assets of the company which have been built up over the years should be returned to the shareholder. Due to political and other influences the market value of a mining share often does not represent the full value of the company's assets and thus the investor can only exercise his sanction at a discount.

There have been occasions in the past where dying mines have been "taken over" because of the attraction of their cash assets. When the take-over is on a 100 per cent basis then this is probably to the mining shareholders' advantage as it eliminates the unavoidably drawn out process of capital returns. However, when the take-over is only partial, just adequate to gain control, the responsibility for company policy is removed from the hands of the original mining directors whilst much of the equity of the company is still held by mining investors. In order to avoid encouraging this type of take-over directors must take the bold decision to start making capital returns at a relatively early stage. Reluctance to make this decision is normally based on the hope that a prospecting programme will give the company a renewed lease of life, this is understandable but a compromise must often be made.

After making an allowance for the special cash capital distribution made on November 14, Kepong's net current assets as at June 30, 1961, represent some 6s. 10d. per share compared with the current market price of 11s. There seems little doubt that the balance will be made up from future earnings both from dredging operations and tributing. The liquidation of the company's main assets should not be an over-lengthy process.

In the first quarter of the current year the output has amounted to 66 tons compared with 76 tons for the same period of the previous year. However, the dredge is at present working through ground below average grade and it is hoped that an improvement will take place shortly.

London Market Highlights

After having a dull patch for a few days the South African gold share market brightened again this week. Several factors were responsible for the change of sentiment, the major one being the news that the U.S. gold reserves had fallen to their lowest level since 1939. Next there were the small relaxations in South Africa's exchange control restrictions, and then on Wednesday came Mr. Selwyn Lloyd's reported reference to the spectre of devaluation, a reference which the Treasury hastily backdated to the state of affairs obtaining in the summer, not now.

The Treasury "clarification" came too late on Wednesday to dampen the forward movement in Kaffirs and prices closed at virtually the best of the day. But it is worth mentioning that, good though the undertone of the market undoubtedly was, at no time did actual business reach more than modest proportions and despite the bullish gold price aspect of the earlier U.S. news, market interest centred not on the marginal producers but on the finance stocks and to a lesser extent on younger mine shares.

In the finance section business was particularly brisk in Gold Fields which moved up 2s. 6d. more to their best price this year of 67s. 6d. Union Corporation showed a similar gain to 61s. 3d. and "Johnnies" advanced 3s. 3d. to 32s. Western Holdings led the gains among the younger mines with an advance of 6s. 10½d. to 126s. 10½d., the move being helped along by some buying from Paris. Free State Geduld followed with a rise of 3s. 1½d. to 96s. 3d. and St. Helena moved up 2s. 3d. to 68s. 9d. Australian golds joined the movement, Lake View being especially firm here with a rise of 1s. 9d. to 25s.

The U.S. decision to suspend sales of Treasury silver and thus pave the way for a free market in the demonetized metal touched off a minor boomlet in any share which was thought to have a silver "flavour". Silver being a by-product as far as the majority of producers are concerned, the anticipated rise in its price can make only a small difference to most company earnings but this factor did not deter the speculators from coming forward. Fresnillo were quickly marked up 7s. 6d. to 48s. 9d., albeit in a very narrow market, and 'Friscos jumped 2s. 3d. to 19s. 9d. Lampa Mines—which will be one of the chief beneficiaries from a higher silver price—gained only 3d. to 2s. 7½d., a reflection of the large bull position which has been built up recently in the shares. Among the Canadian issues, rises of around $2 were quickly established in United Keno Hill $20½, McIntyre Porcupine $84 and Hudson Bay Mining $94 all prices being in "London dollars".

(See Metals and Minerals, page 585.)

Otherwise, the base-metal shares moved only narrowly. Coppers remained dormant until the later dealings on Wednesday when a mild revival of interest produced gains of 1s. among the leading Northern Rhodesian issues. The latest Katanga crisis lowered "Tanks" to 15s. 9d. at one time before a subsequent rally to 16s. 6d. took place. Renewed selling from Singapore coupled with an easier metal price subdued tins for most of the time but the market steadied in the later dealings on Wednesday, a helpful factor being the excellent interim from Southern Kinta.

ARBITRAGE MADE EASIER

The South African Reserve Bank have announced certain alterations in the regulations concerning exchange control. The 90-day limit for the investment of blocked rand has now been abolished and blocked rand obtained from the sale of securities by non-residents may now remain at call or on deposit without a time limit. South African brokers may now extend credit to non-residents covering the period between the overseas sale of scrip and the delivery of the scrip on Johannesburg.

The relaxing of these two regulations does not in any way affect the overall position of the exchange regulations but it does remove some of the irritants that have existed in the operation of the controls. The most important aspect is that the operation of "circular" arbitrage will be made easier. Circular arbitrage is the operation whereby scrip can be exchanged between London and Johannesburg without any actual money moving between the countries. With the current shortage of scrip in both centres it is most important that this exchange should be subject to the minimum of red tape.

The third relaxation that has been introduced will not affect the operations of the stock exchanges though it does provide a means of exit for blocked funds. The blocked rand may now be used for the purchase of National Savings certificates. These certificates mature after five years and on maturity the funds may be repatriated. Under South African law the maximum value of certificates that may be held by any one person is R10,000.

RAND SELECTION FINAL INCREASED

A final dividend of 20 c. per share has been declared on the increased Rand Selection capital; the interim dividend was maintained at 10 c. on the original smaller capital. The final dividend in 1959/60 on the smaller capital was 17½ c.

Early this year the capital was increased under the enlargement scheme from R3,750,000 to R16,540,000 and as a result of the enlargement scheme the new level of income is hardly comparable with previous years. The net group profit for the year is R9,492,000 of which R7,367,000 has been absorbed by the interim and final dividends. The appropriation to revenue reserves is R1,948,000.

KAMUNTING—ADEQUATE PROVISIONS

The past financial year, to March 31, 1961, was very satisfactory for Kamunting. The sales of metal, which included stocks, were 1,861 tons compared with 1,395 tons for the previous year. The average price received for the metal was also £4 per ton higher and the net result was an increase in profit of £88,865 to £364,210. Dividends for the year total 50 per cent compared with the previous 35 per cent and absorbed £204,805. Taxation for the year amounted to £152,500.

Looking to the future Kamunting face a difficult period as it is necessary for them to move both the Malayan dredges at once. The No. 6 dredge exhausted its area at Tekka Taiping in September of this year and it is at present being dismantled for transfer to the Taiping Rubber Company's area. It is expected to start operations there about the middle of 1963. The No. 5 dredge will also have completed its present working area by April, 1962, and it will then be transferred to the Eastern Tailings area.

These moves will not only mean a considerably reduced earnings level but the actual cost of the moves will make heavy claims on the company's resources. However, Kamunting's liquid position is strong and it is anticipated that it will be possible to meet not only the cost of the moves but also to offset the reduction in profits. The net current assets at the time of the balance sheet were over £1,400,000; equivalent to almost seven years' net earnings at the current rate.

Although the No. 6 dredge will not be operating for almost seven months of the current year the immediate outlook is very encouraging. The output for the first seven months of the year is 1,016¾ tons compared with 763½ tons for the same period of 1959-60. The average price received for tin during the first six months of the year was £900 per ton.

Since the end of the financial year the company has received from the Malayan government both its original contribution to the first Buffer stock and its proportion of the surplus. The surplus amounts to £18,242.

KATANGA—UNION MINIERE—U.N.

It is now some seven months ago that the question of the mining royalties and mining share holdings in Katanga was discussed at the Congo Congress committee at Coquilhatville. At the time it was agreed that mining royalties should accrue to individual states though no decision was reached on the ownership of the big shareholdings that were to become available with the liquidation of the Katanga Special Committee.

The decisions of the Coquilhatville conference today seem rather irrelevant and the Katanga government has claimed for its own treasury both the royalties and the 210,000 shares in Union Miniere. The Leopoldville government has also claimed these shares but Katanga appear to be working on the basis that possession is nine-tenths of the law and the dividends on the shares are being paid to the Katanga government as a condition against nationalisation. At present there is no problem for the Katanga authorities in claiming mining royalties and export dues as the normal export route through the Congo is out of action and all exports are via Lobito or Beira.

The precarious equilibrium of this situation has now been upset by the U.N. Security Council resolution authorizing the use of force in connection with the Katanga breakaway. This is no place to discuss the political rights and wrongs of this decision but it must be accepted that its implications to the mining industry of Katanga, and Union Miniere in particular, are serious.

If Katanga is subjected to the rule of Leopoldville then certainly the Central government would be declared the owner of the 210,000 shares and the 22 per cent voting right in Union Miniere. In other circumstances, a large government minority holding in a mining industry can have its advantages but it seems doubtful whether the Leopoldville government would be able to resist the temptation of interfering with sound mining policies for political gains.

This doubt has been expressed in the Brussels bourse and the Union Miniere shares have fallen to a new low of Frs. 986 compared with the price of Frs. 1,650 at the time of Coquilhatville. It is interesting to note that the market value of the shares in dispute has fallen over the past 30 months from some £40,000,000 to less than £15,000,000.

(Continued on page 592)

LONDON METAL AND ORE PRICES, NOVEMBER 30, 1961

METAL PRICES

Aluminium, 99.5%, £186 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £230 per ton
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 11s. 6d. lb.
Cerium (99%) net, £18 0s. lb. delivered U. K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 12s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram
Gold, 249s. 11d.
Iridium, £20/£23 oz. nom.
Lanthanum (98%/99%) 15s. per gram
Magnesium, 2s. 2½d./2s. 3d. lb.
Manganese Metal (96%/98%) £275/£285
Nickel, 99.5% (home trade) £660 per ton
Osmium, £17/£22 oz nom.
Osmiridium, nom.
Palladium, Imported, £8 12s. 6d.
Platinum U.K. and Empire Refined £30 5s.
Imported £27 7s. 6d./£27 17s. 6d.
Quicksilver, £59 ex-warehouse
Rhodium, £43/£45 oz.
Ruthenium, £14/£16 oz. nom.
Selenium, 41s. 0d. per lb.
Silver, 85½d. f. oz. spot and 86d. f'd.
Tellurium, 37s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis	28s. 0d./30s. 0d. per unit c.i.f.
Beryl (min. 10 per cent BeO)	270s./275s. per l. ton unit BeO
Bismuth	30% 5s. 0d. lb. c.i.f. 20% 3s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable 48%) (Ratio 3 : 1)	£15 5s. 0d. per ton c.i.f.
" Hard Lumpy 45% (Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
" Refractory 40% (Ratio 3 : 1)	£11 0s. 0d. per ton c.i.f.
" Smalls 44% (Ratio 3 : 1)	£13 5s. 0d. per ton c.i.f.
Pakistan 48% (Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10:1) $Nb_2O_5 : Ta_2O_5$	150s./160s. 0d. per l. ton c.i.f. nom.
Lithium Ore—	
Petalite min. 3½% Li_2O	50s. 0d./55s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O	76s. 0d./80s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O	75s. 0d./85s. 0d. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore Indian—	
Europe (46%-48%) basis 60s. 0d freight	73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)	69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)	nom.
Molybdenite (85%) basis	10s. 0d. per lb. (f.o.b.)
Titanium Ore—	
Rutile Australian 95/97% TiO_2 (prompt delivery)	£30/£30 10s. per ton c.i.f.
Ilmenite Malayan 50/52% TiO_2	£11 10s. per ton c.i.f.
Ilmenite Travancore 58/60% TiO_2	£15/£15 10s. per ton c.i.f.
Wolfram and Scheelite (65%)	89s. 0d./93s. 0d. per unit c.i.f.
Vanadium—	
Fused oxide 95% V_2O_5	7s. 6d./8s. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 66-67% ZrO_2	£15/£16 15s. ton c.i.f.

WEST WITWATERSRAND AREAS LIMITED

DR. BUSSCHAU'S REVIEW

The Twenty-ninth Annual General Meeting of the above mentioned Company will be held in Johannesburg on December 7. The following is an extract from the Statement to Members by the Chairman, **Dr. W. J. Busschau :—**

It is pleasing to record that the year under review has been one of growth in the total of dividends received by the Company and of encouragement in its exploration programme—in particular, the enhanced results obtained on the Ventersdorp Contact Reef give promise of a substantial increase in the tonnage of economically mineable ore contained in the properties of the West Wits Line.

The Accounts

The Annual Report and Accounts for the year under review, show that the Company's consolidated dividend income at R3,757,987 was R387,985 higher than the figure for the previous year. On the other hand due to the intensification of the drilling programme an amount of R200,126 or R119,602 more than that incurred in the previous year, was expended on exploration. Whilst the consolidated net profit of R3,907,698 is R451,850 less than that of the previous year it should be borne in mind that the accounts for that year included the non-recurring amount of R720,000, being the profit on the realization of 300,000 "A" shares in Western Deep Levels, Limited. This sale was made in order to provide additional cash resources for the purpose of enabling the Company to follow up the further rights attached to its interest in Western Deep Levels Limited and to make other investments.

To the consolidated net profit of R3,907,698 must be added the consolidated unappropriated profit brought forward of R910,496 making a total of R4,818,194. Taxation absorbed an amount of R361,562 and R3,613,153 was absorbed in the payment of two dividends each of 20 cents per share, representing an overall increase of a further 2½ cents per share. A consolidated unappropriated profit of R343,479 was carried forward. Included in the figure for taxation of R361,562 is an amount of R216,000 in respect of an underprovision for 1960 due to the Revenue Authorities having treated the profit of R720,000 referred to above as taxable income in the hands of the Company. The Company objected to the assessment and the Special Income Tax Court has upheld the objection; consequently, the accounts for the current year will reflect a refund of the amount of R216,000, plus interest.

Members will have noted from the Company's Balance Sheet that, notwithstanding the fact that the Company operates as an investment company, it has been considered prudent to provide depreciation in respect of certain of its investments. In this connection a total of R2,727,114 comprising R874,677 in respect of certain quoted investments and R1,852,437 in respect of the wholly-owned subsidiary, Westwits Investments Limited, has been written off Investments. At the same time the opportunity has been taken of transferring from Share Premium to a new account, called Investment Reserve, that portion of the share premium account viz. R11,270,816 which was raised prior to January 1, 1953, the date being significant in that any share premium raised by a company after that date has to be treated to all intents and purposes as share capital whereas there are no restrictions imposed by the Companies Act on share premium raised prior to that date. In addition an amount of R1,000,000 has been transferred from General Reserve to Investment Reserve. After the deduction of the amount of R2,727,114 written off investments the balance of this account at June 30, 1961, was R9,543,702. The change in accounting procedure which will have the effect of showing Investments in the Balance Sheet at a more conservative valuation does not indicate any change in the Company's policy, which remains one of dealing with the Company's mineral rights, and of holding resultant investments for the purpose of drawing the reward in the form of dividends from these investments. The sales of investments which have been made from time to time, have had the sole object of the replenishment of cash resources.

Drilling Operations

During the year under review exploratory drilling was carried out in seven boreholes namely No. E.10E on the farm Gerhardminnebron 139, No. 21 on the farm Rietfontein 349, Nos. 22 and 25 both on the farm Doornkloof 350, Nos. E.8K and E.8L both on the farm Kleinfontein 141, and No. 23 on the farm Elandsfontein 346. Of these, Nos. E.10E and 21 were completed and Nos. 23 and 25 were commenced during the year under review. The main objective of these exploratory drilling operations is to prove down-dip extensions of the known economic reef horizons on the West Wits Line, and consequently the average depth of the boreholes has been greater than previous boreholes, which means that only a limited number of results have been obtained from our operations. The information obtained from some of the boreholes indicates the presence of a high gold tenor over an area much more extensive than hitherto envisaged and it raises the possibility of establishing a new mine to the south and east of Libanon but further drilling is necessary in order to delimit an economically workable mining proposition.

Whilst neither the original borehole No. E.10E nor a deflection intersected the Main Reef or the Carbon Leader owing to faulting, the geological succession disclosed indicated that both economic horizons may be present in this area. Both boreholes E.8K and E.8L, which were sited to the south-west of the Doornfontein mining lease area to explore the various reef horizons at depth, were still traversing the Upper Witwatersrand System at the end of the year under review. During the quarter ended September 30, 1961, borehole E.8K traversed the Kimberley and Bird Reefs but in both cases the gold content of the reefs was low. During the same period borehole E.8L intersected both the Main Reef and the Carbon Leader both of which gave only low values. This borehole has been stopped at 9,300 feet and a deflection was drilled. This intersected the Carbon Leader Reef at 9,085 feet giving a value of 44 inch-dwt. No further work is to be done in this borehole.

The results obtained from boreholes Nos. 21 and 22, which are situated to the east and south of the Libanon mining lease area, prove that they are located west of the Witpoortjie Fault and that the stratigraphic sequence disclosed is a natural down-dip continuation of the strata, including the economic reefs, as known in the Libanon mine. Borehole No. 21 intersected the Ventersdorp Contact Reef at a depth of 8,490 feet assaying 41.2 dwt over a corrected width of 32.0 inches equivalent to 1,318 inch-dwt. and a deflection intersected the same reef at the same depth assaying 95.4 dwt over a corrected width of 32.5 inches equivalent to 3,101 inch-dwt. These are the two highest borehole results obtained by the Company since it commenced operations. Below the Ventersdorp Contact Reef the borehole proceeded in coarse-grained quartzites which contained at depths of 8,837 and 8,849 feet, respectively, bands of the Kimberley Reefs which gave results, in the case of the original borehole and three deflections, varying between 119 and 306 inch-dwt in the case of the top band, and 129 and 364 inch-dwt in the case of the second band. Borehole No. 22 failed to intersect the Ventersdorp Contact Reef due to the presence of an igneous dyke, and the Main Reef was not intersected as it was eliminated by a dyke. The Carbon Leader was intersected but as most of the core was ground away the reef was not assayed. In three deflections the Carbon Leader, Main Reef and Kimberley Reefs were intersected respectively but in each case only low values were obtained Further deflections are now in progress in order to try to intersect the Ventersdorp Contact Reef. The Kimberley Reef values indicate that this reef may be of economic importance in the event of the area being exploited in order to work the Ventersdorp Contact Reef and the Main Reef Group. As a result of these satisfactory results two new boreholes namely Nos. 23 and 25 were commenced during the year to obtain further information regarding this area.

During October 1961 borehole No. 24, which is being drilled by The Consolidated Gold Fields of South Africa, Limited, intersected the Ventersdorp Contact Reef at a depth of 6,517 feet assaying 86.8 dwt over a corrected width of 33.9 inches equivalent to 2,943 inch-dwt. The borehole, which is situated about a mile from the south-eastern boundary of Libanon and about two miles south-west of borehole No. 21, will be sunk to the Main Reef Group before deflections are made to obtain further intersections of the Ventersdorp Contact Reef. The value obtained in this intersection, read in conjunction with the results obtained in borehole No. 21, is of assistance in the attempt to delimit an economically workable mining proposition.

The standard rate of South African company tax is less than 30 cents in the Rand but an examination of the history of the gold mining companies, in which this Company is interested, shows that once these companies' gold mines had been brought to production they soon reached the stage of having to bear an unduly heavy burden of discriminatory taxation. For example, in the year ended June 30, 1961, West Driefontein, which has approximately 6,600 shareholders, distributed dividends totalling R8,450,000 and paid over R9,000,000 in taxation, which is more than the total amount paid (R8,900,000) by the 85,000 individual taxpayers in the Orange Free State on a total assessed income of R138,000,000 i.e. at an average effective rate of 6.5 cents in the Rand in respect of the year ended June 30, 1959, (the latest year for which figures are available). The effective rate

of tax paid by West Driefontein is over 50 cents per Rand. Including the State's share of profit paid by West Driefontein, which during the year under review was in excess of R3,500,000 the amount paid by that company to the Government was more than 72 per cent of its taxable income.

The overall effect of this discriminatory taxation upon the finances of this Company is illustrated by the fact that since the gold mining companies in which this Company is interested commenced operations (or, in the case of Harmony Gold Mining Company Limited since this Company acquired an interest) they have distributed R160,466,000 in dividends and have paid R152,331,000 in taxation and lease consideration. This Company's share of the dividends amounted to R25,079,000 and the proportion of the tax and lease consideration paid by the mining companies attributable to this Company's respective interests in them amounted to R23,622,000. The relationship between dividends paid on the one hand and the amounts payable to the Government in the form of taxation and lease consideration on the other hand is becoming increasingly unfavourable to the members of this Company as others of the gold mining companies in which it is interested reach the tax-paying stage. In the year under review the amounts payable to the Government by such gold mining companies totalling R24,485,000 exceeded the dividends paid by them to their shareholders by R454,000.

It has been and remains the function of this Company to prospect the area over which it owns mineral rights and to promote and finance gold mining companies to exploit areas successfuly prospected. In the nature of things, the areas remaining to be exploited have, on the work done to date, shown themselves to be less attractive than those already turned to account and will require proportionately more work to be done on them before they can be turned to account, if ever. In this connection it is important to realize that the present system of gold mining taxation is doubly discouraging to further prospecting,

> firstly, because before this Company receives any income from its existing portfolio it has already been subjected to an extremely high rate of tax in the hands of the gold mining companies, thus greatly reducing the amounts available to this Company for prospecting and all its other purposes, and secondly, because any future gold mining company must, in present circumstances, be assumed to be subject to the same discriminatory taxation, the practical effect of which is that in order to induce investment the area of gold-bearing ground must have a considerably higher grade than it need have in the absence of discriminatory taxation.

It is clear that gold which could be produced to the benefit of shareholders and the country will be left in the ground unless the rate of gold mining taxation is reduced. The production records which are being achieved mean that gold is now being extracted at a much greater rate than before. A material reduction in the rate of gold mining taxation would greatly assist in ensuring that the effort and funds applied to the prospecting and development of new mining areas provide new ore reserves matching the accelerating depletion of existing gold mining areas and hence in avoiding a steep decline, in the foreseeable future, in the country's income from gold mining.

The expansion of the South African economy depends on an increase in its foreign exchange earnings and for that to happen investment in export industries should be promoted. At all times it should be the duty of the Government to ensure that there are no avoidable obstacles to the most productive investment of the available capital. Now, when the country is suffering from a severe shortage of risk capital, the Government should carry out this duty with greater zeal than usual. It is irrational, and harmful to the economy, therefore, for the Government to maintain a system of gold mining taxation which arbitrarily excludes from consideration as possible fields for investment gold mining areas which on the basis of lower tax rates would give potential investors the net reward they seek. The incongruity of the present tax system becomes the more apparent when it is realized that the contribution which would be made to the country's foreign exchange earnings by the exploitation of new gold mining areas would not be subject to diminution by competition, boycott, loss of preferential customs duties or any other of the vicissitudes of international trade.

Members will have noted that the Chamber of Mines has made further representations on this subject, and the authorities should now treat all these representations with the serious attention they deserve.

Outlook for the Future

As foreshadowed in last year's Statement the last two dividends paid have been at a higher rate of 20 cents per half-year. In the light of possible future dividends receivable the desirability of doing further drilling and of the greater need for maintaining a liquid position, the prospect for the current year, in the absence of unforeseen unfavourable developments, is that it should be possible to maintain the current rate of dividend, viz : 20 cents per half-year.

CHENDERIANG TIN DREDGING

MR. ADDINSELL'S STATEMENT

The Forty-seventh Annual General Meeting of Chenderiang Tin Dredging, Ltd., was held on November 24 in London, **Mr. J. E. Addinsell,** the chairman, presiding.

The following is an extract from his circulated statement :—

Export control was suspended in October, 1960; the accounts, therefore, include six months of unrestricted production. As a result output amounted to 243 tons as compared with 150 tons for 1959/60, and ore sales, which included stocks surplus to quota at the end of September, 1960, totalled 252 tons against 147 tons.

It is reasonable to suppose that following the increase in ore sales profits would have shown an increase, as the net price we received for our tin-ore was not less than that for 1959/60. This would have been the case but for the fact that a non-recurring item of mining expenditure, amounting to over £6,000, had to be met in the early part of the year. In the event the profit was very nearly the same as the previous year and amounted to £8,490 as against £8,928.

After charging £3,721 for tax and adding back the balance brought forward from last year we have £11,683 for appropriation. In view of the non-recurring item of mining expenditure charged to the accounts your Board have decided not to make any allocation to reserves but to recommend a dividend of 12½ per cent.

Suspension of export control has continued during the current year and as a result sales for the first six months amounted to 125¼ tons as against 110¼ tons for the same period in the year under review. Tin-ore prices have also been maintained at levels which have enabled your mine to work at a satisfactory profit for the first six months. As there is not a world surplus of tin at the moment it appears unlikely that any form of restriction will be imposed for the time being.

Since the close of the financial year we have received repayment of our Buffer Stock contributions amounting to £12,386. A further sum of about $9 million, representing Malaya's portion of the profit on the sale of the Stock, is being distributed proportionately to the contributors, and $17,040 (£1,988) has been received in settlement of the amount due to us.

The report and accounts were adopted.

Company News

Associated Electrical Industries announce that Mr. C. R. Wheeler who joined the company as an additional vice-chairman, is to become deputy chairman on January 1. He will also assume the deputy chairmanship of the AEI management companies. Among Mr. Wheeler's other offices is this year's presidency of the British Iron and Steel Federation and a directorship of the Steel Company of Wales.

★

Mr. Lloyd E. Elkins has been elected president of the American Institute of Mining, Metallurgical and Petroleum Engineers for 1962, in succession to Mr. R. R. McNaughton. He will take office on February 20 next during the 91st annual meeting of the Institute, to be held in New York. Mr. Roger V. Pierce, has been named president-elect of AIME 1962.

★

Mr. R. E. Ford has been appointed managing director of International Minerals and Chemicals Ltd., due to the return of Mr. W. T. Bradley to the U.S., where he has taken up an appointment with their American parent company in Skokie, Ill. Mr. J. Leyden, a director of Tororo Industrial Chemicals and Fertilisers, and Williamson Diamonds, has also been appointed to the Board.

★

A. G. Wild & Co. announce the appointment of Mr. Walter Lavin to the company as mining engineer.

★

A British - managed Colliery Organization in India requires ENGINEERS suitably qualified, experienced and capable of supervising and organizing mechanical and electrical engineering work for Colliery Groups within the organization. Contract period three years followed by six months home leave. Free partly - furnished accommodation, medical attention and first-class sea passages provided. Applications from men between the ages of 28 and 35 stating full details of qualifications and experience, etc., to Box NV/92 c/o 95 Bishopsgate, London, E.C.2.

KAMUNTING TIN DREDGING

HIGHER PRODUCTION, SALES AND PROFITS

MR. ADDINSELL'S STATEMENT

The 48th annual general meeting of Kamunting Tin Dredging Limited was held on November 28 at 55-61, Moorgate, London, E.C.2, **Mr. J. E. Addinsell** (the Chairman) presiding.

The following is the Chairman's statement for the year ended March 31, 1961, which had been circulated with the report and accounts and was taken as read :

The year covered by the Report and Accounts was noteworthy in that it saw the lifting of tin export control, which took place on October 1, 1960.

Our combined tin production in Malaya and Thailand was 1,592 tons tin concentrate against 1,378 tons in the previous year, while sales, which included our mine-head stocks of 269 tons brought forward from last year, were 1,861 tons concentrate compared with 1,395 tons previously. The average price realised for our sales was £776 per ton of metal against £772 for 1959/60.

The result of these favourable factors is reflected in the Accounts, from which it will be seen that our profit increased to £364,210 compared with £275,345 for the previous year. We have to provide £152,500 for taxation and, with the interim dividend paid on March 10, 1961, and the final dividend now recommended absorbing in the aggregate £204,805, there is left a sum of £6,905 to be added to our carry forward. I did mention last year that we would add to our Revenue Reserve this year, but on review your Board finds the financial position adequate to meet the capital expenditure on the removal of dredges to which I will now refer.

Since the end of the financial year the No. 6 Dredge has worked out the remaining ore reserves at the Tekka Taiping area and ceased mining operations on September 12, 1961. It is now being dismantled for transfer to the Taiping Rubber Company's area, where it is expected to be ready to start up by about the middle of 1963. It is anticipated that by April, 1962, the No. 5 Dredge will also have worked out its payable reserves, when, as shareholders were informed last year, it will be transferred to the Company's Eastern Tailings area. This unavoidable combined programme must inevitably affect output until the latter part of 1963 and more especially in the financial year 1962/63, when both the Malayan dredges will be out of production. Fortunately, however, our financial position is strong and we have a large revenue reserve which should help to meet the impact of the reduction in profits resulting from the temporary slowing down of production.

Encouraging Outlook

The forecast for the current year which ends on March 31 next is encouraging notwithstanding the loss of production from No. 6 Dredge for nearly seven months of the period, and taking into consideration that the Accounts now before you include sales of carry over stocks which will not be repeated. Shareholders will be aware from the monthly publication in the Press that the combined output from both Malaya and Thailand for the six months to September 30, 1961, already aggregates 937 tons concentrate. The average price realised for tin sales during this period was just under £900 per ton metal.

The expenditure on the transfer of dredges which will be incurred during the next year or so will come from resources which we have specially provided for in our reserves over the years and our position in this respect can be regarded as satisfactory.

With regard to the No. 4 Dredge, the results from the boring of the additional small area we had in mind did not justify our restarting the dredge and in view of its age and small capacity it was sold for scrap after the end of the year under review realizing the satisfactory price of £12,890.

Following the liquidation of the First Buffer Stock scheme on June 30, 1961, the Malayan Government promptly refunded us the contribution of £113,658 which we made and we have subsequently received our share of the surplus amounting to £18,242. No refund of contributions has yet been made by the Thailand Government. Meanwhile, the Company is making its contributions to both Malayan and Thailand Governments in respect of the Second Buffer Stock.

Our Managers in the East, Anglo-Oriental (Malaya) Limited, and their staff, are again deserving of our appreciation. I should like them to know that we have never been unmindful of their excellent co-operation, which we once again look forward to with confidence in the important tasks ahead.

The report and accounts were unanimously adopted.

MINING FINANCE—*Continued*

CHENDERIANG TIN DREDGING

Although the sales of tin improved from 147 tons to 252 tons in the year ended March 31, 1961, the profit before taxation was slightly below the figure for the previous year. This was due to a "non-recurring item of mining expenditure" which amounted to £6,000.

The net profit for the year, after tax, amounted to £4,769 whilst the total dividend at 12½ per cent absorbed £5,742. The carry forward stands at £5,941. In the current year the production for the first six months was 125¾ tons compared with 110½ tons for the same period of the previous year. The output for October, 1961, was 18¾ tons. These results, together with the fact that the capital expenditure was a non-recurring item suggest that the dividend should be improved again this year.

The gross yield on the 12½ per cent dividend at the current London price is 5½ per cent. A further encouraging point is the profit on the Buffer stock that has been paid to the company, an amount of £1,988.

NEW ALLUVIAL TIN IN TASMANIA

Although the present tin production from Tasmania is relatively small it has, in the past been a very important producer. The Mount Bischoff mine in the north-west area was at one time the largest tin mine in Australia and was producing in the 1880's some 2,000 tons of concentrates per annum. To date the total value of tin produced by Tasmania is £31,600,000.

Recently the Government Mines Department conducted a geophysical survey in the St. Helens-Gladstone area, in the north-west, and a substantial deposit of alluvial tin has been indicated. As yet no information is available about the values contained but the general extent of the deposit is such that if the values prove economic then the production from the area might well vie with the old Mt. Bischoff mine. At present, a gravity and seismic survey is in progress and a new percussion drilling plant has recently been purchased in England in order to test the alluvials. It is anticipated that it will be about two years before the drilling programme has reached the point where a definite valuation can be placed on the deposit.

This prospecting work is being carried out by the Mines Department but it is the Government's intention that once the potential of the area has been examined there the mining operations should be handed over to private enterprise.

HARTIES DEVELOPMENT

At the annual meeting in Johannesburg Mr. Bernstein has given some additional development results. Since the quarterly report of September 30, 5,560 feet have been sampled; 88 per cent has proved payable at 445 inch-dwt. of gold and 30.77 inch-lbs. of uranium.

In the north-western section of the mine a total of some 3,870 feet has now been sampled in the vicinity of borehole H.B.18. Over 81 per cent has proved payable at 517 inch-dwts. of gold and 15.85 inch-lbs. of uranium. This is an early, yet welcome, indication of the possible values that will occur in the area to be worked by the No. 5 shaft. This shaft is to be commenced in 1964 and should be commissioned in the latter part of 1966.

S.A. TOWNSHIPS PRELIMINARIES

A dividend of 15 cents has been declared for the year ended September 30, 1961. This is the same as the previous year. The net group profit for the year is R910,000 of which R200,000 has been placed to general reserve and R720,000 has been absorbed by the dividend. No provision for taxation is required.

ANOTHER KIMBERLEY?

It has been reported from South Africa that a new diamond find in the Postmasburg area could rival the great Kimberley pipe. These are early stages for such claims and many will recall that this is not the first time that prospectors have compared their find with Kimberley!

However, in the first test hole the owner says that diamonds are being found at a rate of 50 carats per 100 loads. Most of the stones are whites, the largest, so far, weighed 2½ carats.

*

Ampat Tin.—An interim dividend of 9d. per share, less tax, has been declared with respect to the current year.